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FORTIETH ANNUAL REPORT,

OF THE

MISSOURI

State Board of Agriculture

A Record of the Work for the Year 1907.

ALSO VALUABLE INFORMATION ON BREEDING AND FEEDING LIVE STOCK, IMPROVING THE FERTILITY OF THE SOIL, GROWING CROPS, DAIRYING, AGRICULTURE AND LIVE STOCK STATISTICS, ETC.

PUBLISHED 1908.

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JEFFERSON CITY, MO.

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1907

Officers of the State Board of Agriculture.

President—N. J. Colman, St. Louis.
Vice-President—H. J. Waters, Columbia.
Secretary—Geo. B. Ellis, Columbia.
Assistant Secretary—J. B. Rector, Columbia.
Institute Specialist—S. M. Jordan, Stanberry.
Treasurer—W. A. Bright, Columbia.
State Veterinarian—Dr. D. F. Luckey, Columbia.
State Highway Engineer—Curtis Hill, Columbia.
State Apiary Inspector—M. E. Darby, Springfield.

EXECUTIVE COMMITTEE.

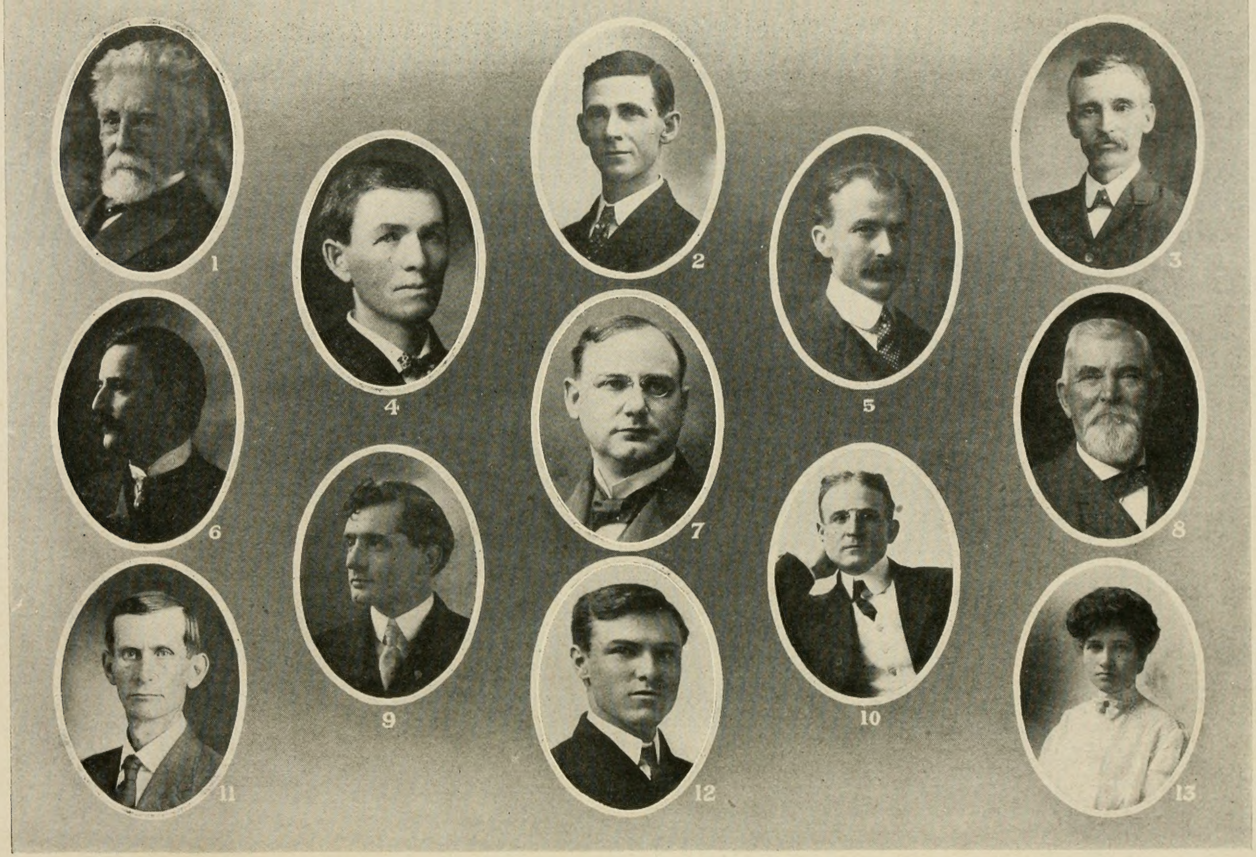
N. J. Colman, St. Louis.
S. W. Hudson, Buckner.
W. R. Wilkinson, St. Louis city.
H. J. Waters, Columbia.
W. C. Hutchison, Jamesport.
W. B. McRoberts, Monticello.
John L. Christian, Rockport.

COMMITTEE ON PUBLIC ROADS.

Governor Jos. W. Folk.
S. W. Hudson.
Allen M. Thompson.
N. J. Colman.
H. J. Waters.
N. H. Gentry.
Geo. B. Ellis.

EX-OFFICIO MEMBERS.

Governor of Missouri—Jos. W. Folk.
Superintendent of Schools—H. A. Gass.
Dean Agricultural College—H. J. Waters.



OFFICERS AND EX OFFICIO MEMBERS STATE BOARD OF AGRICULTURE.

1. Norman J. Colman, President. 2. A. M. Thompson, President State Fair Committee. 3. H. A. Gass, State Superintendent of Schools. 4. Geo. B. Ellis, Secretary. 5. John T. Stinson, Secretary State Fair Committee. 6. H. J. Waters, Dean Agricultural College and Vice-President. 7. Joseph W. Folk, Governor of Mssouri. 8. S. W. Hudson, Vice-President State Fair Committee. 9. Curtis Hill, Highway Engineer. 10. D. F. Luckey, State Veterinarian. 11. S. M. Jordan, Institute Assistant. 12. F. G. King, Institute Assistant. 13. Miss J. B. Rector. Assistant Secretary.

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CORPORATE MEMBERS STATE BOARD OF AGRICULTURE.

1. N. H. Gentry, 7th district. 2. E. E. Swink, 13th district. 3. W. R. Wilkinson, 12th district. 4. A. T. Nelson, 16th district. 5. John Deerwester, 6th district. 6. W. C. Hutchison, 2nd district. 7. R. A. Young, 14th district. 8. J. W. Boles, 9th district. 9. M. B. Greensfelder, 10th district. 10. W. C. Howell, 8th district. 11. W. B. McRoberts, 1st district. 12. J. L. Christian, 4th district. 13. Sanford Mc. Smith, 15th district.

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CORPORATE MEMBERS.

(Term expires July 20, 1908.)

Cong. dist.	Name.	Residence.	County.
2	W. C. Hutchison	Jamesport	Daviess.
3	Allen M. Thompson	Nashua	Clay.
5	Samuel Hudson	Buckner	Jackson.
13	Emmet E. Swink	Farmington	St. Francois.
14	R. A. Young	Alton	Howell.
16	A. T. Nelson	Lebanon	Laclede.
	(Term expires July 20, 1909.)		
1	Wm. B. McRoberts	Monticello	Lewis.
4	John L. Christian	Rockport	Atchison.
7	N. H. Gentry	Sedalia	Pettis.
8	William C. Howell	Ulman	Miller.
15	Sanford Mc. Smith	Carthage	Jasper.
	(Term expires July 20, 1910.)		
6	John Deerwester	Butler	Bates.
9	J. W. Boles	Auxvasse	Callaway.
10	M. B. Greensfelder	Clayton	St. Louis.
11	Norman J. Colman	St. Louis	Holland Building.
12	W. R. Wilkinson	St. Louis	212 North Main St.

OFFICERS OF STATE FAIR DIRECTORY.

President—Allen M. Thompson, Nashua.
Vice-President—S. W. Hudson, Buckner.
Secretary—John T. Stinson, Sedalia.

EXECUTIVE COMMITTEE STATE FAIR DIRECTORY

Allen M. Thompson, Nashua.
Norman J. Colman, St. Louis.
N. H. Gentry, Sedalia.
R. A. Young, Alton.
J. W. Boles, Auxvasse.
E. E. Swink, Farmington.
A. T. Nelson, Lebanon.
S. W. Hudson, Buckner.

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STATE VETERINARIAN AND DEPUTIES.

D. F. Luckey, State Veterinarian	Columbia
Horace Bradley, Deputy State Veterinarian	Windsor
E. Brainerd, Deputy State Veterinarian	Memphis
W. F. Berry, Deputy State Veterinarian	Joplin
L. D. Brown, Deputy State Veterinarian	Hamilton
Henry Boettner, Deputy State Veterinarian	Perryville
L. G. Clark, Deputy State Veterinarian	Nevada
James Cullison, Deputy State Veterinarian	Charleston
A. C. Donahue, Deputy State Veterinarian	Boonville
E. M. Hendy, Deputy State Veterinarian	Jefferson City
R. B. Love, Deputy State Veterinarian	Springfield
J. H. McElroy, Deputy State Veterinarian	Grant City
R. C. Moore, Deputy State Veterinarian	Kansas City
R. J. Mitchell, Deputy State Veterinarian	Kirksville
A. J. Munn, Deputy State Veterinarian	Fayette
F. W. O'Brien, Deputy State Veterinarian	Hannibal
R. P. Poage, Deputy State Veterinarian	Shelbina
J. H. Slater, Deputy State Veterinarian	Richmond
Samuel Sheldon, Deputy State Veterinarian	Trenton
Stanley Smith, Deputy State Veterinarian	Columbia
J. G. Starr, Deputy State Veterinarian	Odessa
C. E. Steele, Deputy State Veterinarian	St. Joseph
T. E. White, Deputy State Veterinarian	Sedalia
H. H. Wolf, Deputy State Veterinarian	Maryville
W. B. Welch, Deputy State Veterinarian	Marshall
H. C. Tuck, Deputy State Veterinarian	Morrisville

Associate Organizations.

IMPROVED LIVE STOCK BREEDERS' ASSOCIATION.

President—Geo. Kitchen, Gower.
Vice-President—C. P. Tutt, Bunceton.
Vice-President—J. A. Wilson, Carthage.
Vice-President—Benton Gabbert, Dearborn.
Vice-President—F. D. Winn, Randolph.
Vice-President—Tom Harris, Lamine.
Vice-President—Harry Sneed, Smithton.
Vice-President—J. W. Boles, Auxvasse.
Vice-President—J. S. Denham, Rocheport.
Vice-President—Dr. S. H. Redmon, Tipton.
Secretary—Geo. B. Ellis, Columbia.
Treasurer—Alex. Bradford, Jr., Columbia.

Executive Committee—W. P. Harned, Vermont; Benton Gabbert, Dearborn, and above officers.

MISSOURI CORN GROWERS' ASSOCIATION.

President—C. O. Raine, Canton.
Vice-President—H. R. Scott, Tarkio.
Vice-President—W. P. Brinkley, Linneus.
Vice-President—F. H. Crowell, Butler.
Vice-President—Elliott Tucker, Perryville.
Vice-President—Chris. Olendorf, Boonville.
Secretary-Treasurer—S. M. Jordan, Columbia.

Executive Committee—Above officers; also, Dean of the Agricultural College and Secretary State Board of Agriculture.

MISSOURI STATE DAIRY ASSOCIATION.

President—Philander P. Lewis, Crescent.
Vice-President—W. S. Dille, Holden.
Second Vice-President—J. E. Roberts, Bolckow.
Secretary—R. M. Washburn, Columbia.
Treasurer—D. A. Chapman, Warrensburg.

MISSOURI SWINE GROWERS' AND BREEDERS' ASSOCIATION.

President—Robt. H. Hudson, St. Marys.
Vice-President—D. B. Mathews, Kirksville.
Second Vice-President—John H. Neff, Boonville.
Secretary—C. A. Wilson, Columbia.
Treasurer—Sam Spelman, Sturgeon.

MISSOURI SHEEP BREEDERS' ASSOCIATION.

President—S. H. Groves, Tipton.
Vice-President—Hon. H. R. Brasfield, Unionville.
Secretary-Treasurer—M. V. Carroll, Sedalia.

DIRECTORS.

John A. Rankin, Tarkio.
Harry Nance, Pattonsburg.
C. E. Bethards, Shelbyville.
S. C. Haseltine, Springfield.
W. W. Waltmire, Raymore.
D. Lee Shawhan, Lee's Summit.

LETTER OF TRANSMITTAL.

State Board of Agriculture, Office of the Secretary,
Columbia, Mo., February 28, 1908.

To Hon. Joseph W. Folk, Governor of Missouri:

Sir—In compliance with the law, I have the honor to transmit herewith a report of the work of the State Board of Agriculture for the year 1907. The Forty-fourth General Assembly enlarged the duties of the Board by adding the departments of Highway Engineering and Apiary Inspection, and the reports of both departments are herein contained.

Very respectfully,

GEO. B. ELLIS, Secretary.

TABLE OF CONTENTS.

Annual Meeting. Pages

Minutes 9-17
Secretary's Report 18-25
Financial Statement 26-37
Treasurer's Report 38-40
Veterinarian's Report 41-55
Highway Engineer's Report 56-58
Apiary Inspector's Report 59-66
Seal Board of Agriculture 67

Farmers' Week—

Historical 69
Swine Growers' Meeting 70-119
Sheep Breeders' Meeting 120-130
Improved Live Stock Breeders' Meeting........ 131-320
Corn Growers' Meeting 321-372
Dairymen's Meeting 373-427
Housekeepers' Conference 428-469

Miscellaneous—

The Home Canner 470-473
Morgan stallion, Charles Reade 474-479
Missouri Crop Review 480-482
Missouri Crop Statistics 483-493
Veterinarians' Tabulated Reports 494-507
Index 508

ANNUAL MEETING.

MINUTES OF PROCEEDINGS.

State Board of Agriculture, Office of the Secretary;
Columbia, Mo., Dec. 17, 1907.

The State Board of Agriculture convened in annual session in the Agricultural building, Columbia, on Tuesday, December 17th, 11 a. m. President S. W. Hudson called the meeting to order, and roll call showed a quorum present, as follows: John Deerwester, J. W. Boles, M. B. Greensfelder, N. J. Colman, W. R. Wilkinson, W. C. Hutchison, A. M. Thompson, S. W. Hudson, E. E. Swink, R. A. Young, A. T. Nelson, W. B. McRoberts, J. L. Christian, N. H. Gentry, W. C. Howell, Sanford Mc. Smith, H. A. Gass and H. J. Waters.

The following members were absent: W. C. Howell and Jos. W. Folk.

Upon motion of Gov. Colman, the minutes of the last annual meeting were adopted as printed in the 39th annual report.

The Secretary read his annual report, and upon motion, the report was approved and ordered printed in the 40th annual report.

The State Veterinarian made a verbal report, and asked permission to file for printing a written report, at a future time, which was granted.

Dr. R. H. Jesse, President State University, called during the meeting and was asked to address the Board. He briefly assured the members of his sympathy with the cause of agricultural education.

The Board took a recess until 2 p. m.

At 2 p. m. the Board was called to order by Vice-President Colman.

The State Highway Engineer submitted his report, which was approved and ordered printed.

Mr. M. E. Darby, Apiary Inspector, submitted a verbal report of his work, showing very satisfactory progress in eradicating foul brood from the apiaries of the State. Mr. Darby was requested to furnish the Secretary with a written report for publication.

COMMITTEE ON COLLEGE OF AGRICULTURE.

The committee appointed to examine the affairs of the Agricultural College submitted their report, which was unanimously adopted.

The report follows:

"Your committee has made a careful examination of the buildings, grounds and equipment of the College of Agriculture, and Experiment Stations, and has the honor to submit the following report:

"1. We find the grounds, buildings and live stock in good condition, well cared for, and all show a very commendable improvement in quality.

"2. We have inspected the experimental work being conducted in farm crops, horticulture, dairying, animal diseases, stock feeding, etc., and feel that they will be of much value to the farmers of the State.

"3. *Hog Cholera*—We feel the work now being conducted in hog cholera and swine plague to be of very vital interest to the State, and would strongly urge that it be pushed to completion as rapidly as possible. These experiments seem to assure successful inoculation against these two diseases, and the moment this has passed the experimental stage we sincerely hope that steps will be taken to produce the serum at the college for free distribution among the hog raisers of the State.

"If equipment of buildings, assistants, pens, live stock, etc., be required for this work, we would strongly urge that the Curators provide out of the funds of the College of Agriculture such equipment.

"4. *Students' Judging Contest*—Every Missourian should feel a just pride in the success of the Missouri Agricultural College students at the recent International Live Stock Judging Contest at Chicago, where first prize for the student making the highest average score for all classes of live stock was won, where first place was won in judging sheep and in judging hogs, and where two out of five of the Armour Scholarships were won.

"We feel that too much emphasis can not well be laid upon this sort of work. We would strongly urge the college authorities to fit a team for this contest annually, and to enter similar contests in other lines as well.

"It is too much to ask the students who participate in these contests to bear their own traveling expenses, and we would recommend that the expenses of these contestants be paid by the institution.

"5. *Show Stock*—We are especially proud of the success of the Animal Husbandry Department, with its stock in all of the shows this year, and we would strongly urge that provisions be made at once for next year's shows with animals that are certain to win. The University cannot afford to spare expense at this point.

"6. *Soil Survey*—We believe that the value of the soil survey is not yet half realized. We would strongly urge that this work be immediately enlarged, in order that all sections of the State may receive the benefit to be derived from it.

"7. *Outlying Experiments*—Closely allied with the soil survey itself is the experimental work in different parts of the State. We believe that this work should be expanded and developed along with the soil survey, in order that the results may be brought to the attention of all the farmers of the State.

"8. *Instruction in Butchering and Packing Meats*—We would strongly urge that instruction in this subject be added. The expense of double transportation on all meat products has to be borne either by the producer or by the consumer.

"The farmer of the future must be a meat packer, especially for home consumption and for local trade. To make this effective, he must know how. We believe the University authorities would be justified in using a portion of the money appropriated to the College of Agriculture by the Legislature to put this work on a first class basis at once.

"9. *Poultry Plant*—We would strongly urge that instruction in poultry be provided for the next college year, in accordance with the act of the last Legislature in appropriating money for this purpose. The poultry industry in Missouri is too important to be neglected by the College of Agriculture in the future as it has in the past.

"10. *Building Site*—We most heartily approve of the site selected for the new Agricultural building, and earnestly urge that the erection of this building be proceeded with at once.

Signed. W. C. HUTCHISON,
J. W. BOLES,
R. A. YOUNG,
Committee.

AUDITING COMMITTEE.

The committee appointed to examine the books and accounts of the Secretary and Treasurer submitted the following report:

"To the Board of Agriculture:

We, the undersigned committee, authorized by the President to examine the books and accounts of the Secretary and Treasurer, and compare the same, beg leave to submit the following report:

"We have carefully examined the vouchers approved by the Executive Committee and the warrants issued by the President and Secretary, and have compared the same with the canceled warrants that have been paid by the Treasurer, and we find approved vouchers for corresponding warrants in the different funds, as follows:

"The following warrants, which had been issued, but had not been presented for payment, at the last annual meeting, December 18, 1906, we find have since been paid by the Treasurer:

MONTHLY CROP REPORT FUND.

Warrants 402, 404, 406—Amount, $34.62.

FARMERS' INSTITUTE FUND.

Warrants 798, 802, 803, 804, 806, 807, 813, 814, 815, 816, 824, 828—Amount, $819.57.

STATE VETERINARY FUND.

Warrants 1872, 1873, 1880—Amount, $50.80.

This makes an exact agreement in the books of the Secretary and Treasurer on December 18, 1906.

EXPENSE OF MEMBER'S FUND.

Balance unappropriated December 18, 1906	$281 02	
Receipts from State Treasurer	700 00	
Warrants 669-703, inclusive, issued and paid		$666 44
Balance unappropriated December 17, 1907		314 58
	$981 02	$981 02

DISTRIBUTION ANNUAL REPORT FUND.

By error		10
Balance unappropriated December 18, 1906		
Receipts from State Treasurer	$800 00	
Warrants 135-141, inclusive, issued and paid		$696 24
Balance unappropriated December 17, 1607		103 66
	$800 00	$800 00

OFFICE EXPENSE FUND.

Balance unappropriated December 18, 1996	$82 91	
Receipts from State Treasurer	500 00	
Warrants 641-684, inclusive, issued and paid		$445 57
Balance unappropriated December 17, 1907		137 34
	$582 91	$582 91

MONTHLY CROP REPORT FUND.

Balance unappropriated December 18, 1906	$68 31	
Receipts from State Treasurer	500 00	
Warrants 410-443, inclusive, issued and paid		$464 00
Balance unappropriated December 17, 1907		104 31
	$568 31	$568 31

APIARY INSPECTION FUND.

Balance unappropriated December 18, 1906		
Receipts from State Treasurer	$1,000 00	
Warrants 1-4, inclusive, issued and paid		$774 25
Balance unappropriated December 17, 1907		225 75
	$1,000 00	$1,000 00

STATE HIGHWAY ENGINEER FUND.

Balance unappropriated December 18, 1906		
Receipts from State Treasurer	$2,000 00	
Warrants 1-24, inclusive, issued and paid		$1,562 77
Ballance unappropriated December 17, 1907		437 23
	$2,000 00	$2,000 00

FARMERS' INSTITUTE FUND.

Balance unappropriated December 18, 1906	$1,518 84	
Receipts from State Treasurer	2,500 00	
Warrants 830-909, inclusive, issued and paid		$3,422 00
Balance unappropriated December 17, 1907		596 84
	$4,018 84	$4,018 84

KANSAS CITY INTER-STATE FAIR FUND.

Balance unappropriated December 18, 1906		
Receipts from State Treasurer	$4,000 00	
Warrants 1-97, inclusive, issued and paid	....	$3,701 45
Balance unappropriated, December 17, 1907	....	298 55
	$4,000 00	$4,000 00

STATE VETERINARY FUND.

Balance unappropriated, December 18, 1906	$1,331 89	
Receipts from State Treasurer	6,000 00	
Warrants 1-97, inclusive, issued and paid	....	$6,968 71
Balance unappropriated December 17, 1907	....	363 18
	$7,331 89	$7,331 89

We find that the following warrants, for which corresponding vouchers are on file, have not been presented to the Treasurer for payment:

FARMERS' INSTITUTE FUND.

No. 909—Amount, $38.06.

STATE VETERINARY FUND.

No. 2011-2017—Amount, $145.37.

KANSAS CITY INTER-STATE FAIR FUND.

No. 94—Amount, $33.50.

STATE HIGHWAY ENGINEER FUND.

No. 23—Amount, $32.40.

"When these warrants have been paid and canceled, there will be an exact agreement in the books of the Secretary and Treasurer.

Signed.

Sanford Mc Smith,
A. M. Thompson,
A. T. Nelson,
Committee.

On motion of Mr. Christian, the report was adopted.

ELECTION OF OFFICERS.

The election of officers was next in order.

Mr. Wilkinson nominated N. J. Colman for President; Mr. Waters moved to suspend the rules, and that the Secretary cast the unanimous ballot for Mr. Colman. It was so ordered.

Mr. Waters and Mr. Boles were put in nomination for Vice-President. A ballot was taken, resulting in the election of Mr. Waters.

Geo. B. Ellis was nominated for Secretary. Upon motion of Mr. Colman, the President was authorized to cast the unanimous ballot for G. B. Ellis for Secretary. It was so ordered, and Mr. Ellis was declared elected.

For Assistant Secretary, Mr. McRoberts moved to suspend the rules, and authorize the Secretary to cast the unanimous ballot for Miss J. B. Rector for Assistant Secretary. It was so ordered.

Mr. Nelson moved to suspend the rules and authorize the Secretary to cast the unanimous ballot for W. A. Bright for Treasurer of the Board. Motion carried, and so ordered.

For State Veterinarian, Dr. D. F. Luckey, Dr. T. F. Arnold and Dr. E. M. Hendy were put in nomination. The result of a ballot showed a majority for Dr. Luckey. Upon motion of Mr. McRoberts, the election of Dr. Luckey was made unanimous.

Judge Wilkinson moved that N. J. Colman, H. J. Waters and S. W. Hudson be elected members of the Executive Committee. Motion carried.

Upon motion of Mr. Gass, Messrs. Hutchinson, Wilkinson, McRoberts and Christian were elected members of the Executive Committee.

Mr. Greensfelder offered the following resolutions:

1st. "Whereas, The 44th General Assembly of Missouri on April 15, 1907, in its appropriations for University and educational institutions, deemed it wise to provide in section 9 of said act, for the erection of a building for the College of Agriculture at Columbia, in the sum of one hundred thousand dollars.

"Whereas, The growing attendance at the University absolutely demand increased facilities, such as the erection of the building intended for by the Legislature will afford; be it

"Resolved, by the State Board of Agriculture, That the President appoint a special committee, whose duty it shall be to take up the matter and push the erection of said building to completion, so that the meeting of the State Board of Agriculture for the year 1908 can be held in said building.

"It is further recommended that as soon as the new bids have been received, the Board of Curators meet in extra session to let the contract, and thus avoid delaying the final settlement of the matter until the April meeting of the Board."

2nd. "The State Board of Agriculture, in view of the actual results obtained by the outlying soil and crop experiments of the Missouri Agricultural Experiment Station in the year 1907, and because of the interest developed through said experiments, and the education afforded by the lessons in good seeds, fertilizers, drainage, etc., hereby approve of said work and recommend that the soil survey work be extended at least 50 per cent during the year of 1908, and that the Legislature be asked to provide funds for the still further enlargement of this work in the future.

"It is likewise earnestly recommended that the number of experimental fields and outlying experiments be increased fully 50 per cent, and that this work be supported in the most liberal manner possible.

"It is ordered that a committee, consisting of the President and Secretary of the Board, be appointed to confer with the Board of Curators in regard to this matter."

3rd. "Whereas, The State Veterinarian, in his annual report to the State Board of Agriculture, December 17, 1907, has stated that the tuberculosis discovered in the herds tested by him during the last few years, can be traced to certain prominent herds in the State of Missouri; and,

"Whereas, Under section 10542, it is the duty of said veterinary surgeon to protect the live stock interests of this State; and,

"Whereas, Section 10546 provides that an investigation of supposed infected or capable of infecting live stock, may be ordered by the Board, if, upon satisfactory information, it is thought the presence of the veterinarian is necessary to a protection of the live stock interests of the State from contagious or infectious diseases; therefore, be it

Resolved, That the State Veterinarian and the Executive Committee of the Board of Agriculture be empowered to take action in the inspection of said prominent herds in the State of Missouri, referred to by the State Veterinarian."

Upon motion, the resolutions were declared adopted.

Mr. Greensfelder moved that the incoming President appoint a committee of three, to which the Highway Engineer's report be referred. Motion carried.

The Board took a recess until 7:30 p. m.

At 7:30 the Board was called to order by President-elect Colman.

Mr. Colman, in a brief address, thanked the Board for the honor conferred upon him by the election.

The Secretary read a letter from Hon. C. R. Davis, member of Congress from Minnesota, calling attention to a bill in Congress making provision for Federal aid for the establishment of agricultural high schools in the State. Mr. Davis requested consideration of the bill. The time being too short for a thorough discussion of the measure, the matter was referred to the Executive Committee.

It was moved by Mr. Greensfelder that a vote of thanks is due the retiring President for the very able manner in which he has discharged the duties of President, and for what has been accomplished. Motion carried.

Mr. Swink moved to continue the committee on roads as now constituted. Motion carried.

Mr. Gass suggested that an educational exhibit be installed at the State Fair. His suggestions were approved and referred to the Executive Committee of the State Fair.

It was moved by Mr. Thompson that all power vested in the Board of Agriculture be and is hereby delegated to the Executive Committee, and that the said Committee is hereby authorized to act for the Board at all times when the full Board is not in session. Motion adopted.

Upon motion, the Board adjourned, to meet in Columbia, January 7, 1908.

GEO. B. ELLIS, Secretary.

REPORT OF SECRETARY.

Gentlemen of the Board:

It is gratifying to me to be in a position to report that the work of the Board of Agriculture for the past year has been fruitful of greater results than, perhaps, any year in the Board's history. You, gentlemen, may not have realized the magnitude of the work done, but time will prove that the things accomplished in this year, 1907, will become a mile post in the history of the agricultural progress of Missouri.

At the last annual meeting, after examining into the affairs of the Agricultural College, as the law requires you to do each year, your Board recommended to the Legislature that an appropriation of $200,000 be made for an adequate Agricultural building, and an appropriation of $87,000 for betterments in the Agricultural College. Through the untiring efforts of your legislative committee, headed by President Hudson, an appropriation of $100,000 for the building, and $75,000 for the College of Agriculture was secured. I am informed that the Board of Curators have approved the architect's plans for the new building and have advertised for bids, and it is hoped the building will be ready for your next annual meeting. The $75,000 for betterments will enable Dean Waters to extend several lines of work that will be of direct benefit to the farmers of the State, the most important of which, perhaps, is the soil survey and crop experiment work inaugurated three years ago. Another recommendation made by the Board at the last annual meeting, and which has borne good fruit, was that the Board of Curators provide funds and the necessary facilities for entering students in the judging contests and a live stock exhibit at the American Royal and International Live Stock Expositions. Out of the increased appropriations secured for the Agricultural College, the above recommendation was carried out with the most successful results. By reference to the appended report, it is shown that the College farm exhibited stock at the Inter-State Fair, Kansas City; the Missouri State Fair, Sedalia; the

American Royal Live Stock Show, Kansas City, and the International Live Stock Show, Chicago.

It should be stated in this connection that this is the first time the College of Agriculture has made an exhibit worthy of notice, which makes the success of the effort of greater importance. The live stock exhibited was awarded aggregate cash prizes, as follows:

Inter-State Fair, Kansas City	$238 00
Missouri State Fair, Sedalia	156 00
American Royal, Kansas City	290 00
International, Chicago	525 00
Total	$1,209 00

In making his report, Prof. Mumford says: "Our exhibit has the distinction among college exhibits (at the International) of being the only one in which every animal shown took a prize, and these prizes were nearly all firsts, seconds and thirds, and the classes were unusually large. Nine champion prizes were included in the prizes won at all the fairs."

In the Students' Judging Contest the college was equally successful. In competition with eight of the leading agricultural states and Canada, at the Interational, Missouri won two out of five of the Armour Scholarships of $250 each. This money goes to the College of Agriculture to be used for assisting worthy students. One of our students—Turner C. Cochran —of Columbia, won first place as the best judge of all classes of live stock, his average score being six points higher than any student has heretofore made in a similar contest. This ought to be gratifying to the Board of Agriculture, as a result of their recommendation made one year ago.

THE INTER-STATE FAIR.

The last Legislature appropriated to the Board of Agriculture five thousand dollars for the purpose of making an exhibit at the Inter-State Fair to be held at Elm Ridge Park, Kansas, September 23rd to October 5th, inclusive. This appropriation was made by the Legislature without the knowledge or request of the officers of the Board. At the July meeting, the Board appointed the President, S. W. Hudson, Dean H. J. Waters and your Secretary on a committee to arrange an exhibit according to the provisions of the appropriation. The very short time made it difficult to assemble a large exhibit, but on the opening day of the Fair your committee had installed a very complete and highly creditable exhibit. The success of the exhibit was made possible only by the co-operation of the Departments of Agronomy, Animal Husbandry, Dairy Husbandry and Home Economics of the College of Agriculture. The Agronomy Department made a fine exhibit of grains, grasses, forage plants, seeds and soils, illustrating the work of the Department, as well as showing the possibilities of soil improvement and the improvement of crops by selection and breeding.

The Animal Husbandry Department made a splendid exhibit of cattle, horses, sheep and hogs, and, as stated elsewhere in this report, competed for and won a number of prizes.

The Dairy Husbandry Department made an exhibit of dairy cattle and a complete working dairy. The working dairy received much favorable commendation from the visitors, and was certainly very creditable to the Department. Five prizes were awarded to the Dairy Department on dairy cattle.

The Department of Home Economics exhibited a model kitchen, showing many conveniences and improvements over the ordinary kitchen. This exhibit was very interesting, judged by the number constantly around the kitchen, and it was certainly a complete success in illustrating some of the work of the department.

In addition to the college exhibit the committee offered the following cash prizes:

COUNTY EXHIBITS.

For the best and largest display of farm products, consisting of grains, vegetables, seeds of all kinds, grasses, forage plants, etc.

First prize	$150 00
Second prize	125 00
Third prize	100 00
Fourth prize	75 00
Fifth prize	50 00

BOYS' CORN CONTEST.

Prizes to be competed for by boys under 15 years of age. Best display of ten ears or more. Corn to be judged by the score card:

First premium	$25 00
Second premium	15 00
Third premium	10 00

BOYS' CORN CONTEST.

For boys over 15 years of age. Best display of ten ears or more. Corn to be judged by the score card:

First premium	$25 00
Second premium	15 00
Third premium	10 00

COLLECTIVE EXHIBIT.

For the best individual exhibit of agricultural products, comprising same scale of points as in county exhibits:

First prize	$25 00
Second prize	15 00
Third prize	10 00

HORTICULTURE.

Best and largest collection of fruit, correctly named and labeled. Open to any county or local Society or one or more individuals in the county in the State of Missouri, fruit all to be grown in the county from which entry is made:

First prize	$75 00
Second prize	50 00
Third prize	40 00
Fourth prize	30 00
Fifth prize	25 00

This list of prizes brought out five excellent county exhibits, as follows:

Pettis county, installed by Wm. Romig.

Atchison county, installed by Geo. H. Sly, Rockport.

Cooper county, installed by Chris. Smith, Bunceton.

Platte county, installed by C. Thorpe.

Lawrence county, installed by Simon Baumgartner, Pierce City.

The exhibits consisted of a collection of practically all of the agricultural products of the counties, and were certainly very creditable to the counties and the exhibitors.

The Inter-State Fair was not a financial success, and was put into the hands of a receiver before it closed; but the Board of Agriculture was in no way responsible for any part of the Fair, except the installation above mentioned, which was required by an act of the Legislature.

THE NEW ROAD LAW.

For many years the Board of Agriculture has agitated a better system of road construction and maintenance, but until this year no material advancement had been made. Last year, as mentioned in my annual report, this office arranged for and conducted a series of district road conventions, with a view of crystallizing public sentiment in favor of a few fundamental principles in a reorganized road system of the State. The meetings terminated with a State convention, held by the Board of Agriculture, co-operating with the county courts of the State, held in Jefferson City, January 16-17 of this year. The convention was attended by more than three hundred delegates, representing a majority of the counties of the State. After two days' deliberation, in which many members of the Legislature participated, the convention unanimously endorsed the plan recommended by the Board of Agriculture, and a committee was appointed to confer with the Committee on Roads in the House and Senate. The members of this committee were: Judge J. R. Hairston of Fayette; Hon. J. H. Bothwell of Sedalia; Hon. W. W. Lawton, Osceola; Judge Woods of St. Joseph, and Geo. B. Ellis, Columbia.

An agreement was soon reached with the joint committee on roads, and bills were drafted covering every recommendation of the Board, and were all finally enacted into law.

The laws which were enacted provide for:

State aid to the counties to the amount of $1,475,000.

The creation of the office of State Highway Engineer, under the control of the State Board of Agriculture, with an appropriation of twelve thousand dollars for expenses of the department.

The creation of the office of county highway engineer, for every county in the State, under authority of the county court.

A complete revision of the working system, providing for certain work by contract and the maintenance of the entire road mileage.

The submission of a constitutional amendment, giving the county courts discretionary power to levy 25 cents on the $100 valuation for road purposes.

The submission of a constitutional amendment providing for a levy of ten cents on the $100 valuation of all State property for a permanent State Road fund.

The road legislation accomplished, together with that secured for the improvement of the Agricultural College, supports without question, I think, the statement that the present year has been fruitful of greater results for the betterment of agriculture than any year in the history of the Board.

HIGHWAY ENGINEER.

In compliance with the law creating the office of State Highway Engineer, the Board, at a called meeting, held in St. Louis on July 6th, elected to that office Curtis Hill, who immediately entered upon the duties of the office. Mr. Hill will report to you directly concerning the working of his department.

APIARY INSPECTION.

The last Legislature enacted a law authorizing the Board of Agriculture to appoint a State Apiary Inspector for the development and protection of the bee industry of the State. At a meeting of the Board held in Kansas City on June 5th, M. E. Darby of Springfield was elected to that office, and through his efforts 215 apiaries have been inspected, of which 82 were found to contain colonies affected with foul brood. There were 3,028 colonies inspected, of which 297 were affected with foul brood. All of these colonies were either treated or destroyed by the inspector, and the apiaries cleared of the disease.

FARMERS' INSTITUTES.

The farmers' institute meetings continue with about the same good interest of last year. A new feature inaugurated this year, with the co-operation of the Agricultural College and some of the State Normal Schools, is to conduct short courses in agriculture in the Agricultural Department of the Normal School, co-operating. Under this arrangement four of these courses are now being given, viz.: Maryville, Kirksville, Warrensburg and Cape Girardeau. A complete course of these schools will be appended as soon as the terms close.

Complying with authority given the Executive Committee at the last annual meeting, S. M. Jordan of Stanberry was employed as institute assistant, and entered upon his duties July 1. Mr.

Jordan has been employed almost constantly in the field conducting meetings. Under the arrangement of your committee with the Board of Curators, Mr. Jordan will be employed for half the time by the Board of Agriculture and the other half by the Agricultural College. Mr. Jordan is doing splendid work, and I most heartily recommend his continuance.

THE YEAR'S HARVEST.

A complete report of this year's harvest will be appended to this report, and in this connection will call attention to only a few statements:

Our farmers grew 7,086,059 acres of corn this year, which is 1 per cent more than the acreage last year; but the average yield per acre for the State is 7-10 of a bushel less, and the total yield 600,000 bushels below last year. The average farm price on December 1st this year was 47 cents per bushel, compared with 37 cents one year ago; making the total value of the crop $109,000,000, or $24,000,000 greater than the crop of 1906.

Of wheat, we produced 28,830,000 bushels, which is nearly 6,000,000 less than in 1906, but the crop this year, based on the average farm price, is worth $19,000,000 more than last year.

The hay crop averaged 1.3 tons per acre as compared with only 7-10 of a ton per acre last year, and while the average farm price is one dollar per ton below last year, the total value is $23,000,000 greater.

The oats crop is practically the same as last year, but the total value is nearly $2,000,000 greater.

FARM BOYS' ENCAMPMENT.

Mr. S. M. Jordan, Institute Assistant, held on his farm in Gentry county, last August, the first Encampment. The object of the Encampment is set forth in Mr. Jordan's announcement, as follows:

"Now For the Boys' Encampment.

"On Glenview Farm, otherwise known as the Geo. Morton farm, two miles north of McCurry, I will hold a farm boys' encampment for one week, beginning August 19th and ending August 24th.

"Every farm boy in Gentry county who will join a county farm boys' club is invited. No expense in any way except car fare to and from McCurry. I will take good care of everyone, board and everything free.

"The forenoons of two days, Tuesday and Wednesday, will be taken up in our seed corn work, examining methods of soil preparation, cultivation, selection and storing of seed, with a lesson each day on corn-judging. Thursday and Friday to stock-judging, etc. Some of the best men in the State will be with us, and all lectures will be demonstrated. Tools used in the work will be examined and the work demonstrated on a small plat of ground.

"Afternoons will be devoted to sports and games, such as the boys may desire. The place where we meet is northeast of the house on a hill in a fine grove.

"On Friday I want each boy to make a written report of the week's work, and the boy who makes the best one will be given a free scholarship to the short-course, 8 weeks, in the Agricultural College at Columbia, car fare, board, room and all expenses paid.

"Every farm boy between the ages of ten and twenty is earnestly invited to come, and I can assure you one of the best times of your life."

Professor M. F. Miller of the Agricultural College, and D. H. Doane of the Department of Agriculture, Washington, D. C., assisted Mr. Jordan in instructing the boys. Altogether, 132 boys were enrolled.

Atchison and Nodaway counties are arranging to hold a similar encampment next year in connection with their summer Chautauqua meetings; other counties are considering a like arrangement.

LOOKING TO THE FUTURE.

We should not be satisfied with what has been done, but should be encouraged to place our aim still higher. To my mind, the greatest work the Board could do for the State would be to bring about the establishment of *Secondary Agricultural Education* within the reach of every farm boy of the State; and the work started one year ago, looking to the establishment of a State Agricultural School, admitting the graduates from the rural schools, should be prosecuted to a successful conclusion.

SECRETARY'S FINANCIAL STATEMENT.

To the Board of Agriculture:

I beg leave to submit the following exhibit of the financial transactions of the Board for the year beginning December 19, 1906, and ending December 16, 1907, which shows the balances on hand at the beginning of the year, the requisitions drawn on the State Auditor, the warrants drawn on W. A. Bright, Treasurer of the Board, the balances in the treasury of the Board, and the balances in the different funds remaining in the State treasury:

EXPENSE OF MEMBERS FUND.

Date.	War. No.	Name.	Dr.	Cr.
1906.				
Dec. 18		To balance	$281 02	
" 19	669	By J. L. Christian		$22 60
" 19	670	John Deerwester		16 00
" 19	671	W. C. Howell		17 15
" 19	672	A. T. Nelson		27 10
" 19	673	W. B. McRoberts		13 98
" 19	674	W. T. Carrington		6 05
" 19	675	S. W. Hudson		21 90
" 19	676	N. J. Colman		11 00
" 19	677	M. B. Greensfelder		14 05
" 19	678	E. E. Swink		18 00
" 19	679	W. R. Wilkinson		11 20
" 19	680	A. M. Thompson		18 35
" 19	681	N. H. Gentry		6 50
" 19	682	Geo. B. Ellis		1 50
" 19	683	W. C. Hutchison		19 85
1907.				
Feb. 5	684	S. W. Hudson		30 40
April 1	685	Geo. B. Ellis		36 88
" 1	686	M. B. Greensfelder		44 30
" 1	687	H. J. Waters		15 80
" 1	688	W. C. Hutchison		54 85
" 1	689	S. W. Hudson		2 75
" 1	690	A. T. Nelson		20 20
" 1		To requisition	200 00	
June 5	691	By H. A. Gass		10 98
" 5	692	A. T. Nelson		20 20
" 5	693	W. C. Howell		29 55
" 5	694	N. J. Colman		25 00
" 5	695	Geo. B. Ellis		15 30
" 5	696	W. B. McRoberts		18 00
" 5	697	John Deerwester		7 00
" 5	698	J. L. Christian		18 00
" 5	699	E. E. Swink		26 00
" 5	700	N. H. Gentry		8 60
" 5	701	S. W. Hudson		20 10
" 5	702	M. B. Greensfelder		22 50
" 5	703	W. C. Hutchison		14 80
" 5		To requisition	300 00	
Dec. 2		To requisition	200 00	
" 17		By balance		314 58
			$981 02	$981 02

DISTRIBUTION OF ANNUAL REPORT FUND.

Date.	War. No.	Name.	Dr.	Cr.
1907.				
Oct. 16		To requisition	$600 00	
“ 19	135	By S. H. Elkins		$130 00
“ 26	136	S. H. Elkins		120 00
Nov. 1	137	R. P. Scurlock		39 03
“ 14	138	S. H. Elkins		180 00
“ 14	139	R. P. Scurlock		25 23
Dec. 2	140	Pacific Express Co		145 35
“ 2	141	American Express Co		56 63
“ 2		To requisition	200 00	
“ 17		By balance		103 76
			$800 00	$800 00

OFFICE EXPENSE FUND.

Date.	War. No.	Name.	Dr.	Cr.
1906.				
Dec. 18		To balance	$82 91	
1907.				
Jan. 10	641	By J. R. Ellis		$15 00
Feb. 5	642	Smith Premier Typewriter Co		30 00
“ 5	643	J. R. Ellis		11 36
“ 5	644	W. E. Harshe		1 95
Mar. 7	645	Wabash R. R. Co		3 09
“ 7	646	J. R. Ellis		10 75
April 1	647	J. R. Ellis		11 71
“ 1	648	National Paper Co		36 25
“ 1	649	C. C. Newman & Co		1 50
“ 1	650	Columbia Gas Works		2 05
“ 1	651	Strawn-Holland D. G. Co		26 00
“ 1	652	J. B. Rector		36 70
“ 1		To requisition	200 00	
May 9	653	By Pacific Express Co		2 05
“ 9	654	W. E. Harshe		5 15
“ 9	655	J. R. Ellis		10 92
“ 9	656	J. B. Rector		18 35
June 5	657	S. H. Elkins		3 25
“ 5	658	American Express Co		1 06
“ 5	659	Columbia Telephone Co		8 90
“ 5	660	C. C. Newman & Co		2 90
“ 5	661	W. E. Harshe		1 95
“ 5	662	J. R. Ellis		10 65
“ 5	663	W. J. Carothers		6 00
“ 5		To requisition	100 00	
July 6	664	By Lemuel Crouch		10 70
“ 6	665	W. J. Carothers		6 30
“ 6	666	M. K. & T. R. R. Co		1 20
“ 6	667	Nifong Mfg. Co		4 75
Aug. 5	668	American Express Co		1 40
“ 5	669	Lemuel Crouch		10 70
“ 31	670	Chas. Matthews		3 00
“ 31	671	Lemuel Crouch		12 95
Oct. 2	672	W. E. Harshe		3 50
“ 2	673	Columbia Telephone Co		10 55
“ 2	674	J. R. Ellis		7 60
“ 2		To requisition	100 00	
“ 16	675	By Smith Premier Typewriter Co		28 50
Nov. 1	676	S. H. Elkins		15 00
“ 1	677	J. R. Ellis		12 41

OFFICE EXPENSE FUND—Continued.

Date.	War. No.	Name.	Dr.	Cr.
1907.				
Nov. 1	678	By C. Harvey		$9 15
" 1		To requisition	$100 00	
" 14	679	By Columbia Statesman		6 50
" 14	680	W. E. Harshe		1 90
" 14	681	Eloise Kneisley		4 42
" 20	682	Troxell & Finley		17 50
Dec. 2	683	Count Harvey		10 00
" 2	684	J. R. Ellis		10 00
" 17		By balance		137 34
			$582 91	$582 91

MONTHLY CROP REPORT FUND.

Date.	War. No.	Name.	Dr.	Cr.
1906.				
Dec. 18		To balance	$68 31	
1907.				
Feb. 5	410	By National Paper Co		$9 95
Mar. 7	411	S. H. Elkins		20 00
April 1	412	National Paper Co		35 00
" 1	413	S. H. Elkins		10 00
" 1	414	Smith Premier Co		35 00
" 1		To requisition	200 00	
May 9	415	By Columbia Statesman		28 50
" 9	416	M. K. & T. R. R. Co		3 08
" 9	417	S. H. Elkins		3 95
" 9	418	S. H. Elkins		10 00
June 5	419	Columbia Statesman		5 50
" 5	420	S. H. Elkins		8 00
" 5	421	Smith Premier Co		3 25
" 5	422	S. H. Elkins		30 00
July 6	423	American Express Co		2 51
" 6	424	S. H. Elkins		25 00
" 6	425	S. H. Elkins		5 25
" 6	426	National Paper Co		20 91
" 6	427	Smith Premier Co		14 70
" 6		To requisition	200 00	
Aug. 5	428	By Columbia Statesman		5 00
" 5	429	Barnes-Crosby Co		26 55
" 5	430	S. H. Elkins		5 00
" 5	431	S. H. Elkins		25 00
" 31	432	S. H. Elkins		22 00
" 31	433	Barnes-Crosby Co		7 66
" 31	434	American Express Co		85
" 31	435	Smith Premier Co		4 00
Oct. 2	436	Columbia Statesman		2 50
" 2	437	H. Harvey		7 50
" 16	438	Columbia Statesman		10 50
Nov. 1	439	S. H. Elkins		25 00
" 14	440	Smith Premier Co		2 25
" 20	441	National Paper Co		17 64
Dec. 2	442	Eloise Kneisley		1 95
" 2	443	S. H. Elkins		30 00
" 2		To requisition	100 00	
" 17		By balance		104 31
			$568 31	$568 31

APIARY INSPECTION FUND.

Date.	War. No.	Name.	Dr.	Cr.
1907.				
Aug. 5		To requisition	$500 00	
" 5	1	By M. E. Darby		$168 30
Oct. 2	2	M. E. Darby		215 65
" 16	3	M. E. Darby		111 07
" 16		To requisition	500 00	
Dec. 2	4	By M. E. Darby		279 23
" 17		By balance		225 75
			$1,000 00	$1,000 00

STATE HIGHWAY ENGINEER FUND.

Date.	War. No.	Name.	Dr.	Cr.
1907.				
July 6		To requisition	$500 00	
" 6	1	By W. R. Wilkinson		$2 50
" 6	2	J. L. Christian		26 50
" 6	3	W. C. Howell		15 85
" 6	4	S. W. Hudson		28 85
" 6	5	W. C. Hutchison		22 10
" 6	6	Geo. B. Ellis		15 40
" 6	7	H. J. Waters		21 15
Aug. 5	8	Curtis Hill		250 20
" 5	9	A. M. Thompson		19 07
" 5	10	N. H. Gentry		10 60
" 5	11	S. W. Hudson		20 30
" 5	12	Geo. B. Ellis		9 40
" 5		To requisition	500 00	
" 26	13	By S. W. Hudson		20 50
" 26	14	Geo. B. Ellis		5 40
" 31	15	Curtis Hill		258 18
Sept 23	16	S. H. Elkins		15 00
Oct. 2	17	Columbia Statesman		8 00
" 2	18	Curtis Hill		247 25
" 2		To requisition	500 00	
" 16	19	By Columbia Statesman		6 50
Nov. 1	20	Curtis Hill		270 12
" 14	21	Columbia Statesman		5 00
" 20	22	Troxell & Finley		52 50
" 20	23	Economy Drawing Table Co		32 40
Dec. 2	24	Curtis Hill		200 00
" 2		To requisition	500 00	
" 17		By Balance		437 23
			$2,000 00	$2,000 00

FARMERS' INSTITUTE FUND.

Date.	War. No.	Name.	Dr.	Cr.
1906.				
Dec. 18		To balance	$1,518 84	
1907.				
Jan. 10	830	By Walter Williams		$113 72
" 10	831	J. R. Hairston		42 74
" 10	832	F. P. Spalding		47 45

FARMERS' INSTITUTE FUND—Continued.

Date.	War. No.	Name.	Dr.	Cr.
1907.				
Jan. 10	833	By L. F. Childers		$85 14
“ 10	834	C. H. Eckles		23 87
“ 10	835	D. Ward King		197 75
“ 10	836	M. F. Miller		15 30
“ 10	837	F. G. King		6 00
“ 10	838	H. Krusekopf		6 00
“ 10	839	M. M. McCool		6 00
“ 10	840	M. E. Sherwin		6 00
“ 10	841	J. W. Read		6 00
“ 10	842	E. L. Lusk		1 80
“ 10	843	T. R. Powell		2 32
“ 10	844	V. Frieze		2 32
“ 10	845	Columbia Statesman		33 25
“ 10	846	A. T. Nelson		23 75
“ 10	847	W. C. Howell		18 40
“ 10	848	Strawn-Holland Co		4 15
“ 10	849	S. M. Jordan		120 51
“ 10	850	P. E Crabtree		52 49
“ 10	851	C. O. Raine		83 38
“ 10	852	M. F. Miller		31 35
“ 10	853	Shields & Court		3 00
“ 10	854	Geo. H. Beasley		4 50
“ 10	855	Geo. B. Ellis		67 69
Feb. 5	856	A. P. Grout		15 80
“ 5	857	W. L. Miller		30 81
“ 5	858	Miles Elliot		69 60
“ 5	859	C. G. Hopkins		44 84
“ 5	860	St. Louis Button Co		25 00
“ 5	861	Geo. B. Ellis		72 96
“ 5	862	Shige Suzuki		16 45
“ 5	863	H. B. Gurler		51 55
“ 5	864	Oscar Erf		20 02
“ 5	865	A. M. TenEyck		23 62
“ 5	866	Turner Gordon		10 00
“ 5	867	H R. Smith		27 05
“ 5	868	R. M. Washburn		21 50
Mar. 7	869	Smith Premier Co		4 80
“ 7	870	Miles Elliot		15 80
“ 7	871	M. A. Cochel		1 50
“ 7	872	C. E. Thorne		35 00
“ 7	873	R. E. Talbert		3 45
“ 7	874	S. H. Elkins		5 00
“ 7	875	F. L. Kelso		10 00
April 1	876	National Paper Co		50 00
“ 1	877	S. M. Jordan		77 70
“ 1	878	Geo. B. Ellis		8 53
“ 1	879	Columbia Typ. Exchange		2 50
“ 1	880	P. E. Crabtree		70 34
“ 1	881	S. H. Elkins		10 00
“ 1	882	D. Ward King		64 70
“ 1		To requisition	$500 00	
May 9	883	By National Paper Co		8 75
June 5	884	S. H. Elkins		20 00
“ 5	885	D. Ward King		68 84
“ 5	886	Columbia Statesman		15 00
July 6	887	D. Ward King		36 62
“ 6	888	Barnes-Crosby Co		18 88
“ 6	889	J. W. Waller		1 00
“ 6		To requisition	500 00	
Aug. 5	890	By S. M. Jordan		196 18
Sept. 13	891	S. M. Jordan		140 67
Oct. 2	892	S. M. Jordan		125 00

FARMERS' INSTITUTE FUND—Continued.

Date.	War. No.	Name.	Dr.	Cr.
1907.				
Oct. 2	893	S. M. Jordan		$79 69
" 2		To requisition	$500 00	
Nov. 1	894	By S. M. Jordan		125 00
" 1	895	M. L. Lipscomb		1 88
" 14	896	L. F. Childers		22 30
" 14	897	S. M. Jordan		70 48
" 14	898	H. J. Waters		6 27
" 14	899	H. D. Hughes		15 83
" 20	900	F. B. Mumford		21 30
" 20	901	D. Ward King		68 74
" 20	902	J. C. Whitten		23 98
" 20	903	H. D. Hughes		14 80
" 20	904	G. W. Williams		65 83
" 20	905	M. F. Miller		68 34
Dec. 2	906	Barnes-Crosby Co		6 75
" 2	907	C. D. Lyon		158 17
" 2	908	S. M. Jordan		210 24
" 2	909	P. E. Crabtree		38 06
" 2		To requisition	$1,000 00	
" 17		By balance		596 84
			$4,018 84	$4.018 84

KANSAS CITY INTERSTATE FAIR FUND.

Date.	War. No.	Name.	Dr.	Cr.
1907				
July 22		To requisition	$500 00	
" 22	1	By H. J. Waters		$12 96
" 22	2	S. W. Hudson		14 25
" 22	3	Geo. B. Ellis		10 58
Aug 31	4	S. W Hudson		12 25
" 31	5	Geo. B. Ellis		12 00
" 31	6	C. H. Eckles		11 46
Sept 13		To requisition	2,000 00	
" 13	7	By M. E. Sherwin		41 18
" 13	8	S. W. Hudson		13 50
" 13	9	F. B. Mumford		10 29
" 13	10	L. Stanley		9 34
" 13	11	Geo. B. Ellis		13 23
" 23	12	F. G. King		75 00
" 23	13	Clinton Yates		11 60
" 23	14	C. H. Eckles		150 00
" 23	15	Wabash R. R.		178 50
" 23	16	C. H. Eckles		13 55
" 23	17	Arms Palace Horse Car Co		30 00
" 23	18	Henry Heil Chemical Co		15 65
" 23	19	Blanke & Hauk		11 80
" 23	20	H. S. Gladfelter		30 93
" 23	21	H. S. Wayman		50 00
" 23	22	Edna Day		150 00
" 23	23	S. H. Elkins		10 00
" 23	24	Geo. B. Ellis		13 00
" 23	25	M. F. Miller		70 00
" 23	26	H. J. Waters		13 64
" 23	27	Forest Nace Box Co		14 00
" 23	28	Edna Day		100 00

KANSAS CITY INTERSTATE FAIR FUND—Continued.

Date.	War. No.	Name.	Dr.	Cr.
1907.				
Oct. 2	29	By Barnes-Crosby Co		$6 12
" 2	30	H. R. Nelson		30 00
" 2	31	W. C. Hutchison		14 95
" 3	32	H. S. Wayman		200 00
" 3	33	B. P. McKinley & Co		33 25
" 3	34	Scannell Plumbing Co		45 00
" 3	35	Geo. H. Sly		175 00
" 3	36	Chris Smith		140 00
" 3	37	Simon Baumgartner		50 00
" 3	38	C. Thorp		75 00
" 3	39	Wm. Romig		150 00
" 3	40	D. T. Vannote		50 00
" 3	41	H. J. Waters		13 79
" 3	42	Scannell Plumbing Co		35 00
" 3	43	Chas. Hull		10 00
" 3	44	S. W. Hudson		23 75
" 3	45	Louise Stanley		34 20
" 3	46	Arthur Rhys		220 25
" 3	47	Elm Ridge Coal & Feed Co		124 00
" 3	48	Geo. B. Ellis		11 54
" 3		To requisition	$1,500 00	
" 16	49	By Columbia Statesman		50 00
" 16	50	Smith Premier Co		1 75
" 16	51	Mutual Ice & Fuel Co		2 19
" 16	52	Wabash R. R. Co		10 80
" 16	53	Columbia Printing Co		56 50
" 16	54	Creamery Pkg. Mfg. Co		33 89
" 16	55	F. P. Miller		40 50
" 16	56	J. W. Waller		42 50
" 16	57	Baker & Lockwood		18 50
" 16	58	Barnes-Crosby Co		6 80
" 16	59	Missouri Dairy Co		96 00
" 16	60	A. H. Glass		11 00
" 16	61	Louis Kreuz		3 00
" 16	62	F. B. Mumford		15 54
" 16	63	Forest Romig		25 00
" 16	64	Willie Harris		15 00
" 16	65	Henry Ohlendorf		25 00
" 16	66	Oliver Harris		15 00
" 16	67	Ben Smith		10 00
" 16	68	Edw. Schmalfeld		10 00
" 16	69	American Express Co		2 20
" 16	70	L. E. Cline		16 14
" 16	71	Sanford McSmith		8 00
" 16	72	Pacific Express Co		2 12
" 16	73	Geo. B. Ellis		18 93
" 16	74	S. W. Hudson		14 50
" 16	75	H. J. Waters		20 98
" 19	76	Chas. Matthews		136 50
" 19	77	Edna Day		18 73
" 26	78	C. A. Schwarze		2 10
" 26	79	Edna Day		22 50
" 26	80	Parker Furn. Co		29 20
" 26	81	J. W. Read		32 55
" 26	82	I. T. Vannote		42 20
" 26	83	Lewis Knudson		34 74
" 26	84	M. F. Miller		16 14
" 26	85	H. S. Wayman		53 87
" 26	86	C. H. Eckles		43 92
" 26	87	C. T. Yates		1 70
" 26	88	H. R. Nelson		45 74
" 26	89	O. A. Herzog		3 60

KANSAS CITY INTERSTATE FAIR FUND—Continued.

Date.	War. No.	Name.	Dr.	Cr.
1907.				
Oct. 26	90	By M. E. Sherwin		$10 00
" 26	91	A. J. Summers		26 70
Nov. 1	92	Wabash R. R. Co.		10 00
" 1	93	Pacific Express Co		1 30
" 14	94	West's Machine Shop		33 50
" 20	95	J. R. Keithley		10 00
" 20	96	Creamery Pkg. Mfg. Co		12 00
Dec. 2	97	Pacific Express Co		2 06
" 17		By Balance		298 55
			$4,000 00	$4,000 00

STATE VETERINARY FUND.

Date.	War. No.	Name.	Dr.	Cr.
1906.				
Dec. 18		To balance	$1,331 89	
" 19	1887	By G. F. Troxell		$15 00
1907.				
Jan. 10	1888	Smith Premier Co		25 90
" 10	1889	American Express Co		2 85
" 10	1890	R. L. Allen		177 66
" 10	1891	S. H. Elkins		7 00
" 10	1892	B. H. Hawkins		40 00
" 10	1893	R. C. Moore		2 50
" 10	1894	Smith Premier Co		6 25
" 10	1895	Stanley Smith		24 40
" 10	1896	Columbia Typewriter Exchange		1 00
" 10	1897	H. H. Wolfe		8 00
" 10	1898	Columbia Statesman		6 00
" 10	1899	D. F. Luckey		194 62
" 10	1900	Columbia Telephone Co		3 20
" 10	1901	T. E. White		11 45
" 10	1902	W. J. Corothers		10 00
Feb. 5	1903	C. G. Cullison		74 56
" 5	1904	S. H. Elkins		7 00
" 5	1905	Columbia Statesman		3 00
" 5	1906	Minnie Foster		4 00
" 5	1907	R. L. Allen		196 01
" 5	1908	D. F. Luckey		185 54
" 5	1909	B. H. Hawkins		40 00
" 5	1910	W. J. Carothers		10 00
Mar. 7	1911	B. H. Hawkins		40 00
" 7	1912	Western Union Co		3 89
" 7	1913	Columbia Statesman		4 50
" 7	1914	S. H. Elkins		14 00
" 7	1915	W. J. Carothers		9 45
" 7	1916	Pacific Express Co		4 82
" 7	1917	D. F. Luckey		189 87
" 7	1918	S. H. Elkins		5 00
" 7	1919	Minnie Foster		1 00
April 1	1920	H. H. Wolfe		19 43
" 1	1921	R. C. Moore		15 00
" 1	1922	Horace Bradley		9 30
" 1	1923	J. H. Slater		16 35
" 1	1924	R. L. Allen		207 21
" 1	1925	R. B. Love		70 24
" 1	1926	S. H. Elkins		22 00

STATE VETERINARY FUND—Continued.

Date.	War. No.	Name.	Dr.	Cr.
1907.				
“ 1	1927	By B. H. Hawkins		$40 00
“ 1	1928	Columbia Telephone Co		9 75
“ 1	1929	National Paper Co		50 00
“ 1	1930	D. F. Luckey		187 79
“ 1		To requisition	$1,500 00	
May 9	1931	By Horace Bradley		24 10
“ 9	1932	Columbia Telephone Co		3 00
“ 9	1933	R. P. Poage		15 20
“ 9	1934	W. F. Berry		100 95
“ 9	1935	F. W. O'Brien		11 85
“ 9	1936	R. C. Moore		73 75
“ 9	1937	S. H. Elkins		7 00
“ 9	1938	R. L. Allen		234 54
“ 9	1939	B. H. Hawkins		40 00
“ 9	1940	D. F. Luckey		247 69
“ 9	1941	W. J. Carothers		7 00
“ 9		To requisition	500 00	
June 5	1942	By B. H. Hawkins		40 00
“ 5	1943	S. H. Elkins		53 30
“ 5	1944	R. C. Moore		15 00
“ 5	1945	S. Sheldon		10 00
“ 5	1946	H. H. Wolf		17 25
“ 5	1947	L. D. Brown		19 20
“ 5	1948	J. H. McElroy		6 25
“ 5	1949	E. Brainerd		9 24
“ 5	1950	D. F. Luckey		208 59
“ 5		To requisition	1,000 00	
July 6	1951	By E. Brainerd		11 46
“ 6	1952	R. C. Moore		29 55
‘ 6	1953	D. F. Luckey		204 62
“ 6	1954	H. F. Boettner		37 01
“ 6	1955	Stanley Smith		12 00
“ 6	1956	F. W. O'Brien		15 86
“ 6	1957	W. D. McKee		38 64
“ 6	1958	Hatton & Knight		12 00
“ 6	1959	Geo. B. Ellis		15 81
“ 6	1960	S. H. Elkins		20 00
“ 6	1961	B. H. Hawkins		40 00
“ 6	1962	S. W. Hudson		31 50
“ 6	1963	J. M. Courtright		45 00
“ 6	1964	A. T. Peters		100 00
“ 6	1965	L. D. Brown		48 40
Aug. 5	1966	B. H. Hawkins		40 00
“ 5	1967	Columbia Statesman		9 50
“ 5	1968	R. L. Allen		209 03
“ 5	1969	D. F. Luckey		243 62
“ 5	1970	E. Brainerd		15 84
“ 5	1971	H. F. Boettner		18 30
“ 5	1972	Horace Bradley		16 55
“ 5	1973	R. C. Moore		22 00
“ 5	1974	W. J. Carothers		6 60
“ 5		To requisition	1,000 00	
“ 31	1975	By H. V. Goode		22 59
“ 31	1976	S. Sheldon		14 00
“ 31	1977	J. E. Taylor		41 10
“ 31	1978	B. H. Hawkins		40 00
“ 31	1979	W. E. Dabbs		190 67
“ 31	1980	D. F. Luckey		207 58
Sept 23	1981	C. Murphy		36 00
“ 23	1982	F. I. Vandeventer		3 50
Oct. 2	1983	Hatton & Knight		4 00
“ 2	1984	Columbia Statesman		3 50

STATE VETERINARY FUND—Continued.

Date.	War. No.	Name.	Dr.	Cr.
1907.				
Oct. 2	1985	Chas. Doerrie		$8 75
" 2	1986	R. C. Moore		45 00
" 2	1987	R. L. Allen		202 80
" 2	1988	Horace Bradley		6 74
" 2	1988	J. E. Taylor		72 48
" 2	1990	D. F. Luckey		279 41
" 2	1991	J. H. Slater		37 49
" 2	1992	W. E. Dabbs		46 83
" 2		To requisition	$1,000 00	
" 3	1993	By S. W. Hudson		73 75
" 16	1994	J. E. Taylor		50 60
" 16	1995	Jas. Cullsion		9 36
" 16	1996	R. C. Moore		50 00
" 16	1997	Columbia Statesman		11 00
" 16	1998	R. P. Poage		8 02
" 16	1999	F. W. O'Brien		23 30
" 16	2000	E. Brainerd		19 20
Nov. 1	2001	J. H. Slater		19 44
" 1	2002	R. C. Moore		47 50
" 1	2003	L. D. Brown		22 71
" 1	2004	E. M. Marten		50 00
" 1	2005	D. F. Luckey		202 82
" 1	2006	R. B. Love		7 22
" 1	2007	S. H. Elkins		12 75
" 1	2008	S. H. Elkins		14 00
" 1	2009	Eloise Kneisley		10 65
" 14	2010	Columbia Statesman		17 00
" 20	2011	W. F. Berry		42 37
" 20	2012	Horace Bradley		33 39
" 20	2013	H. H. Wolf		8 50
" 20	2014	H. V. Goode		15 98
" 20	2015	Stanley Smith		14 26
" 20	2016	J. E. Taylor		69 03
" 20	2017	W. E. Dabbs		103 00
" 20		To requisition	1,000 00	
Dec. 2	2018	By E. M. Martin		50 00
" 2	2019	D. F. Luckey		230 35
" 2	2020	Stanley Smith		19 69
" 2	2021	R. C. Moore		47 25
" 2	2022	F. W. O'Brien		14 96
" 2	2023	H. V. Goode		15 38
" 2	2024	E. M. Hendy		11 74
" 2	2025	R. P. Scurlock		18 31
" 17		By balance		363 18
			$7,331 89	$7,331 89

SUMMARY OF SECRETARY'S FINANCIAL STATEMENT.

EXPENSE OF MEMBERS FUND.

Date.		Dr.	Cr.
December 18, 1906	To balance	$281 02	
April 1, 1907	To appropriation	1,200 00	
	By vouchers paid		$666 44
	balance with our treasurer		314 58
	balance with State Treasurer		500 00
		$1,481 02	$1,481 02

FARMERS' INSTITUTE FUND.

Date.		Dr.	Cr.
December 18, 1906...	To balance	$1,518 84	
April 1, 1907	To appropriation	10,000 00	
	By vouchers paid		$3,422 00
	balance with our treasurer		596 84
	balance with State Treasurer		7,500 00
		$11,518 84	$11,518 84

OFFICE EXPENSE FUND.

Date.		Dr.	Cr.
December 18, 1906...	To balance	$82 91	
April 1, 1907	To appropriation	1,000 00	
	By vouchers paid		$445 57
	balance with our treasurer		137 34
	balance with State Treasurer		500 00
		$1,082 91	$1,082 91

STATE VETERINARY FUND.

Date.		Dr.	Cr.
December 18, 1906...	To balance	$1,331 89	
April 1, 1907	To appropriation	16,200 00	
	By vouchers paid		$6,968 71
	balance with our treasurer		363 18
	balance with State Treasurer		10,200 00
		$17,531 89	$17,531 89

STATE HIGHWAY ENGINEER FUND.

Date.		Dr.	Cr.
April 1, 1907	To appropriation	$12,000 00	
	By vouchers paid		$1,562 77
	balance with our treasurer		437 23
	balance with State Treasurer		10,000 00
		$12,000 00	$12,000 00

APIARY INSPECTION FUND.

Date.		Dr.	Cr.
April 1, 1907	To appropriation	$2,000 00	
	By vouchers paid		$774 25
	balance with our treasurer		225 75
	balance with State Treasurer		1,000 00
		$2,000 00	$2,000 00

KANSAS CITY INTERSTATE FAIR FUND.

Date.		Dr.	Cr.
April 1, 1907	To appropriation	$5,000 00	
	By vouchers paid		$3,701 45
	balance with our treasurer		298 55
	balance with State Treasurer		1,000 00
		$5,000 00	$5,000 00

DISTRIBUTION ANNUAL REPORT FUND.

Date.		Dr.	Cr.
December 18, 1906	To balance in Treasury, Board of Agriculture		
April 1, 1907	Amount of appropriation	$8,000 00	
December 18, 1906 to December 17, 1907	By warrants drawn for distributing annual report		$696 24
	By amount paid for printing and binding annual report, account with Printing Commission		3,214 58
December 17, 1907	By balance in treasury, Board of Agriculture		103 76
December 17, 1907	By balance in State Treasury		3,985 42
		$8,000 00	$8,000 00

MONTHLY CROP REPORT FUND.

Date.		Dr.	Cr.
December 18, 1906	To balance in our treasury	$68 31	
April 1, 1907	amount of appropriation	2,000 00	
December 18, 1906 to December 17, 1907	By warrants drawn on Treasurer Board of Agriculture		$464 00
December 17, 1907	By amount paid for printing bulletins, account with Printing Commission		127 05
December 17, 1907	By balance in treasury, Board of Agriculture		104 31
December 17, 1907	By balance in State Treasury		1,372 95
		$2,068 31	$2,068 31

TREASURER'S REPORT.

To the State Board of Agriculture:

I, W. A. Bright, Treasurer of the Board of Agriculture, submit the following report of the amount of money received from the State Treasurer, including balances, and the amounts paid out on warrants presented against the several funds of the Board of Agriculture, and the balances now on hand, all for the year ending December 13, 1907:

PRINTING OF ANNUAL REPORT.

Date.		Dr.	Cr.
September 21	By overdraft		$ 10
October 19	To State warrant	$600 00	
December 6	State warrant	200 00	
December 13	By warrants paid and cancelled		696 24
December 13	balance		103 66
		$800 00	$800 00

MONTHLY CROP REPORT.

Date.		Dr.	Cr.
December 15, 1906	To balance	$102 93	
May 20, 1907	State warrant	200 00	
July 15, 1907	State warrant	200 00	
December 6, 1907	State warrant	100 00	
December 13, 1907	By warrants paid and cancelled		$498 62
December 13, 1907	balance		104 31
		$602 93	$602 93

EXPENSE OF MEMBERS' FUND.

Date.		Dr.	Cr.
December 11, 1906	To balance	$281 02	
May 20, 1907	State warrant	200 00	
June 8, 1907	State warrant	300 00	
December 6, 1907	State warrant	200 00	
December 13, 1906	By warrants paid and cancelled		$666 44
December 13, 1907	balance		314 58
		$981 02	$981 02

FARMERS' INSTITUTE FUND.

Date.		Dr.	Cr.
December 17, 1906	To balance	$2,338 41	
May 20, 1907	State warrant	500 00	
July 10, 1907	State warrant	500 00	
October 7, 1907	State warrant	500 00	
December 6, 1907	State warrant	1,000 00	
December 13, 1907	By warrants paid and cancelled		$4,203 51
December 13, 1907	balance		634 90
		$4,838 41	$4,838 41

OFFICE EXPENSE FUND.

Date.		Dr.	Cr.
December 17, 1906	To balance	$82 91	
May 20, 1907	State warrant	200 00	
June 8, 1907	State warrant	100 00	
October 7, 1907	State warrant	100 00	
October 5, 1907	State warrant	100 00	
December 13, 1907	By warrants paid and cancelled		$445 57
December 13, 1907	balance		137 34
		$582 91	$582 91

STATE VETERINARY FUND.

Date.		Dr.	Cr.
December 17, 1906	To balance	$1,382 69	
May 20, 1907	State warrant	1,500 00	
June 3, 1907	State warrant	500 00	
June 8, 1907	State warrant	1,000 00	
August 9, 1907	State warrant	1,000 00	
October 7, 1907	State warrant	1,000 00	
December 6, 1907	State warrant	1,000 00	
December 13, 1907	By warrants paid and cancelled		$6,874 14
December 13, 1907	balance		508 55
		$7,382 69	$7,382 69

SALARIES AND EXPENSE OF APIARY INSPECTION FUND.

Date.		Dr.	Cr.
August 9, 1907......	To State warrant.........................	$500 00	
October 19, 1907....	State warrant.........................	500 00	
December 13, 1907...	By warrants paid and cancelled...........	....	$774 25
December 13, 1907...	balance...............................	....	225 75
		$1,000 00	$1,000 00

KANSAS CITY INTERSTATE FAIR FUND.

Date.		Dr.	Cr.
July 31, 1907.......	To State warrant.........................	$500 00	
September 23, 1907..	State warrant.........................	2,000 00	
October 7, 1907.....	State warrant.........................	1,500 00	
December 13, 1907...	By warrants paid and cancelled...........	....	$3,667 95
December 13, 1907...	balance...............................	....	332 05
		$4,000 00	$4,000 00

HIGHWAY ENGINEER OR STATE HIGHWAY ENGINEER FUND.

Date.		Dr.	Cr.
July 10, 1907.......	To State warrant.........................	$500 00	
August 9, 1907......	State warrant.........................	500 00	
October 7, 1907.....	State warrant.........................	500 00	
December 6, 1907....	State warrant.........................	500 00	
December 13, 1907...	By warrants paid and cancelled...........	....	$1,530 37
December 13, 1907...	balance...............................	....	469 63
		$2,000 00	$2,000 00

Very respectfully submitted,

W. A. Bright, Treasurer.

REPORT OF STATE VETERINARIAN.

Mr. President and Gentlemen of the State Board of Agriculture:

I must again call your attention to many unwholesome conditions existing in connection with the slaughtering of food animals in this State. Following the agitation some two years ago, country slaughter houses were temporarily cleaned up. A large per cent of the butchers of the State have drifted back into the old rut and are slaughtering animals for food in plants that are so filthy as to make it entirely impossible to dress a carcass in them and have it clean enough to be fit to eat. A number of butchers are making a practice of taking diseased animals from the stock yards and slaughtering them for food. I am reliably informed that one firm, at least, handles practically nothing but diseased stuff. Such practices by even a few, are bound to reflect discredit upon and damage the reputation of all plants not having meat inspection, in addition to imposing upon the public with meat unfit to eat.

The practice of slaughtering diseased animals is bound to grow and is growing, on account of the rejection of such stuff by plants having inspection, and the field being left clear for their use by plants having no inspection. Sooner or later the evil effects of this must be felt, not alone by the guilty, but by those who have plants in proper condition, and who use only healthy animals.

As was suggested in the annual report of 1906, and in a bulletin on meat inspection, crooked practice on the part of a few butchers, among those who have no meat inspection, reflects discredit upon them all. During the next few years the process of weeding out tuberculous cows from the herds of the State and sending them to the market for slaughter will go on more rapidly than ever before. Naturally, large numbers of these, especially those that are condemned on a private test by their owners, will be sold to unsuspecting packers without any notice of their diseased condition. It is not possible to foretell just how bad the results will be, but the way is clear for the few who engage in ignorant and unlawful practices to almost ruin the independent packing industry. Every sort of practice which tends to bring independent packing plants into disrepute should be stopped.

A bill authorizing the Board of Agriculture to prevent the removal of diseased animals from the public markets was defeated in the House of the last General Assembly. Bills (1) regulating sanitary conditions about slaughter houses, and (2) authorizing all cities of the State to provide by ordinance for meat inspection and a city abattoir, were defeated in the Senate committee. The protection of the public from unwholesome and diseased meat, and the promotion of the packing industries makes such legislation necessary.

During the past two years, while trust packers have been receiving attention from the Federal Government, there has been a great opportunity to build up a magnificent, independent packing industry in this State. It is true that independent plants have been a little more prosperous than usual during this period, but all disputes between the packing trust and the government are liable to be settled in the course of time, and when they are, I am satisfied that the trust will be in a position to do the lion's share of the packing business. Instead of being contented to let well enough alone and let independent plants enjoy a temporary prosperity, the opportunity ought to have been taken advantage of to encourage the development of so many deserving independent packing houses, as to have provided abundant markets for live stock. The one great essential to the successful operation of a packing plant is that it turn out wholesome meat.

I still believe that the State ought to have a law authorizing all county and city boards of health to enforce cleanliness in all slaughter houses and the disinfection of such houses after each slaughter, and require the removal of offal some distance away from them. The law ought to authorize all cities to provide at will, for meat inspection and for slaughtering all food animals at a city abattoir or other approved plant. In large cities there onght to be a sufficient number of city abattoirs to accommodate all the butchers who have no approved plant of their own, or are not doing enough slaughtering to justify the authorities in keeping a city inspector at their plant.

SCABIES.

During the year 1907 there were 25 shipments from this state to the public markets, of sheep affected with scabbies. These shipments orginated in almost as many different sections of the State. In every case the origin of the shipment was investigated by this department. The stock pens, through which the sheep were loaded, were quarantined until properly disinfected by the railroad over which the shipment was made. The history of every lot of scabby sheep was traced out as far as possible, and all infected flocks placed in quarantine until dipped and cured. The same practice was carried out in connection with scabby cattle, of which there were nine shipments during the year.

In about three-fourths of the investigations of sheep and cattle scabies, it was found that the infection in this State was introduced by sheep and cattle imported from other western states. In about one-half of the outbreaks, it was found that the infection has come direct from the stock yards. The extreme small number of outbreaks of scabies among sheep and cattle compared to the great numbers of shipments of these animals imported from territory more or less infected with this disease, reflects great credit upon the system of field and stock yards inspection maintained by the Federal Bureau of Animal Industry.

The outbreak of scabies among sheep in Laclede county, has apparently been stamped out. On account of lack of funds and the necessary amount of help, the work in Laclede county was not as complete as desired, but the fact that no scabby sheep were shipped from the county during the year 1907, indicates that very little, if any, infection remains.

Altogether, the indications are that scabies exists anywhere in this State only to a very limited extent. A few outbreaks, incident to the importation of sheep and cattle from the western ranges are unavoidable, and may be expected from time to time in the future.

Under present arrangement it is almost impossible for any outbreak to gain much headway. This disease is easily cured, and we may reasonably expect to keep the losses from it down to the minimum.

TEXAS FEVER.

During the past year Texas fever ticks were found on cattle in Ripley, Oregon, Jasper, Newton, McDonald and Barry counties. These ticks have been more or less prevalent in Southwest Missouri for years. They were first noticed in Ripley county in 1906, and were apparently carried there and spread over the county by western horses. The infection in Oregon county seems to have been spread there by ticky cattle ranging over the line from Sharp county, Arkansas.

The general plan adopted by this department for preventing the spread of the fever ticks and eradicating them from the infected areas, was (1) to place all infested cattle and pastures in quarantine, (2) to require all cattle ranging on infested ground to be greased every four weeks, and (3) to forbid the use of infested pastures by any cattle or horses except they were greased every four weeks. An especial effort was made to have every cow in the State, ranging on any infested ground, greased after cold weather to prevent the possibility of her carrying any ticks through the winter on her body. To complete the eradication of the fever ticks in the State will require the burning over of all infested ground before warm weather, toward which a campaign of education has been continually carried on by all inspectors engaged in the work. A healthy sentiment has been developed in favor of burning the infested ranges and pastures, and the only remaining element of doubt about the results is whether or not the weather will be dry enough for thorough burning. The amount of infection which will remain in the State during the coming year, depends wholly upon the thoroughness with which the infested pastures and ranges are burned over. If, at any time, before warm weather, there is an opportunity to do this burning effectively the work will be promptly attended to.

Dr. R. L. Allen was employed to take charge of the tick eradication work in Southwest Missouri for the month of July and August. Mr. W. E. Dabb, a cattleman of Anderson, Missouri, was employed to assist him and to attend to whatever work was left to do, after Dr. Allen's time expired. With the assistance of Mr. J. E. Taylor of Oregon county, I attended to this work in Ripley county in person.

During the season, 78 lots of cattle were quarantined in Ripley county, 8 in Oregon, 9 in Jasper, 40 in Newton, 27 in McDonald and 1 in Barry. I wish to explain that hunting up and finding all the lots of tick infested cattle is a very tedious matter. These lots, usually small, are found scattered through different neighborhoods and in many cases in almost inaccessible ranges. Some of the herds in Ripley county, among which ticks were found, were so badly scattered in uninhabited range, that it required, in some cases, two to four weeks' riding for their owners to find all of them. Yet, under the method pursued, no infested cattle got away from Southwest Missouri to the public markets or outside neighborhoods, as far as we are able to learn, and only a few infested individuals were shipped out of Ripley county undetected in four or five shipments.

I believe that every ticky animal in the State was quarantined and disinfected. If it is possible to get the infested pastures and ranges burned over before any cattle become re-infested in the spring, there ought to be very little, if any, infection left in the State next year.

GLANDERS.

The number of cases of glanders found over the State during the year 1907, was 117. Of the animals condemned, 89 were in Kansas City, and 28 over the balance of the State. From the number found over the State it may be judged that fair success has been obtained in stamping out this disease. As long as shipments of horses into and through the State continues, especially horses from western ranges, where glanders is somewhat prevalent, a few outbreaks are bound to occur. Compared to the traffic in horses through this State the number of cases, outside of Kansas City, indicates a good condition of affairs. On the other hand the number of cases found in Kansas City is sufficient to warrant grave consideration of the matter. I believe that a careful investigation of actual conditions in Kansas City would show glanders much more prevalent than is indicated by the number of cases reported. During the past five years Kansas City has had more cases of glanders than all the rest of the State together. Considering that every effort has been made to stamp out glanders in Kansas City and the fact that this disease is still so prevalent, is just cause for alarm.

In this connection it is well to note that in 1903, when glanders was widespread in Kansas City, the most perfect system possible was put into operation for its eradication. The work was begun in August of that year by securing the services of some thirty-four Bureau of Animal Industry inspectors, with whose assistance practically all of the horses in the city, outside of the large, well kept stables, were inspected in one day. This was followed up with a systematic campaign in which the field officers of the Humane Society and the entire police force of the city were enlisted in reporting animals which they found on the streets showing symptoms of glanders. All cases reported were investigated by Dr. R. C. Moore, Deputy State Veterinarian, and all animals found affected with glanders were quarantined and later destroyed by the sheriff. The water was shut off from the public watering basins. The results were highly satisfactory, and there was a gradual decrease in the number of cases each month, until the following April, when there were none reported. Following this the water was turned on again, and the number of cases of glanders almost simultaneously began to increase. Since then the story has been the same. With the water shut off, the number of cases of glanders has decreased. With it turned on, the number of cases has increased.

The watering basins in Kansas City, are so constructed as to allow teams of horses to approach them from different directions. They are circular, about four feet high and about forty inches in diameter. When a number of horses are drinking from one of these basins at the same time, their noses are only a few inches apart. If one of these horses happens to be affected with glanders, it may convey the disease to all the others in a few minutes' time. In all other outbreaks of glanders over the State, for the past eight years, all dangerous watering troughs have been promptly dispensed with, and the outbreaks have been completely stamped out. As long as the present type of watering trough is maintained in Kansas City, there is no hope of controlling glanders. In justice to the balance of the State, and especially to the farming community adjacent to Kansas City, where a number of outbreaks of glanders have occurred by infection direct from the city, some remedy ought to be applied. Unless the dangerous type of watering basin is abolished so that the disease may be controlled in the city, a quarantine restricting the movement of horses into and out of the city is a necessity.

HOG CHOLERA.

Since September, 1902, there have been 880 shipments of hogs, diseased with cholera, from this State to the public markets. Each of these shipments represented a loss in the locality from which it came. In some cases this local loss was small. In a number of cases it was very large. The loss in one county from which only a single shipment of diseased hogs came, amounted to at least $150,000.00. Another county, which was swept over by an outbreak of the cholera, sent only two shipments of diseased hogs to the market. Two other counties which had extensive outbreaks and consequent heavy losses sent no such shipments. Altogether it seems that there must have been a local loss averaging at least $10,000.00 at the point of origin of each of the 880 shipments. At least, the total loss from hog cholera in this State, during the past five years, can not be placed below $8,000,000.00. The exhibition of a lot of hogs diseased with cholera this year at our State Fair, resulted in the infection of choice hogs from our finest registered herds. Almost without exception these hogs were returned to the herd without the precaution of keeping them in quarantine for 30 days. They were the source of the infection which has not only ruined many of our best registered herds, but spread the disease throughout the various neighborhoods in which they belonged. Whatever the loss from this amounts to, it must be added to the $8,000,000.00 already accounted for, to get at the total loss from hog cholera in the past few years.

During the drouth of 1901, the stock hogs were shipped out of this State or killed outright to such an extent as to leave barely one-half of the normal number in the farmers' hands. In 1902 the bumper corn crop raised in the State, created a big demand for stock hogs to which to feed it. Anticipating the results that always follow the promiscuous shipping of stock hogs, this department undertook to forestall the impending outbreak. On investigation it was found that the funds available for veterinary control work would not permit this department to put any effective system of control into operation. With a view to preventing the spread of disease as far as possible, the three stock yards of the State were quarantined and the authorities in charge were forbidden to allow any hogs to be removed therefrom except for immediate slaughter. Information concerning hog cholera and directions for preventing its introduction into and spread through this State, was published broadcast in the market reports and all agricultural papers. The principal directions given were in regard to handling stock hogs, and they hold good today. These instructions warned buyers to avoid buying stock hogs in any neighborhood where the cholera was present. They advised the owner to disinfect any car used for shipping hogs, by washing it with a corrossive sublimate solution 1 to 1,000. They also advised that *whenever hogs are moved from one place to another they should be kept in quarantine for at least* 25 *days before they are turned in with other hogs*. Then during the session of the Legislature in 1903, after the cholera had gotten well started, a special appropriation of $6,000 was asked for hog cholera control work. This appropriation was not made.

Detailed mention of this matter is made to show the results in the past, that we may begin in time to plan to prevent a repetition of another such loss in the future. Probably three-fourths of the total loss from hog cholera came directly from hogs shipped into the various neighborhoods in the State. If farmers had made a practice of quarantining for 25 or 30 days, all stock hogs which had been shipped and the appropriation of $6,000.00 had been made, I believe that at least $6,000,000.00 of the loss could have been saved. Unless we make due preparation for the future, and take up the work of hog cholera control in the proper way, this same loss will occur from time to time in the future as it has in the past. It is almost impossible to ship hogs from one place to another without getting them exposed to the cholera. As long as the State allows them to be shipped from place to place without restriction, just so long will enormous losses from cholera occur.

By some authority the shipment of all stock hogs ought to be restricted. The shipper ought to be required to disinfect the car used. He ought to be required to keep the hogs quarantined for 30 days after arrival at point of destination before they are turned in with other hogs or offered for sale. If, in the quarantine period, a disease appears among them, the whole lot ought to be shipped to market for immediate slaughter, observing due care to follow with proper disinfection, or be slaughtered and burned and indemnity granted their owner by the State.

This regulation may be either embodied in a statute or the power conferred upon the Governor to prescribe such regulation by proclamation, as the emergency might require.

A close study of the history of this last outbreak shows plainly wherein efficient control work would have prevented the most, if not nearly all of it. With the information gained by experience with the outbreak just passed, it seems reasonable that with efficient laws and the necessary funds, another outbreak can be made very limited if not prevented altogether. As a further evidence of this fact, we will notice that in the five years during which Missouri spent nothing in the control of hog cholera, and lost more than $8,000,000.00 from the disease, the Dominion of Canada spent less than $100,000.00 in control work and lost less than $25,000.00. In other words, the State of Missouri is out $8,000,000.00 plus the loss of many of our registered herds, and the whole Dominion of Canada is out $125,000.00. The work we are planning now was planned and carried out in Canada more than 15 years ago. It is impossible with any amount of money to jump into the midst of a widespread outbreak of hog cholera and control it. The necessary laws must be passed and the money appropriated for the work in advance is that each little outbreak can be stamped out before the disease spreads *beyond* control.

There are two factors which will enter into the future work for controlling hog cholera which have not heretofore been put into practice, viz.: Immunizing and breeding immune. Both of these are now well enough understood to be used to some extent, at least, and it is possible that by their extensive use the hog cholera may be stamped out absolutely. Although the method for immunizing hogs against cholera and the one for breeding them immune from it are more or less crude and untried, there is no doubt about the complete success of either. If these methods can be put into general practice, which is entirely feasible, the disease can be controlled without any law restricting the movement of stock hogs and with much less expense.

IMMUNIZING.

The fact that hogs may be completely immunized against cholera has been thoroughly demonstrated by the Federal Bureau of Animal Industry and verified by the Missouri Experiment Station. A hog which is known to be immune from cholera is used in the beginning of the operation. The fact that he is immune from cholera is ascertained by his having gone through an outbreak of cholera without taking it or has taken it and recovered. This hog is injected with a culture of hog cholera germs. The reaction from this injection causes a still more intense immunity and the hog is spoken of as "hyper-immunized." The blood of the hyper-immunized hog is drawn by cutting off a short section of his tail. The serum of this blood is injected into the hog, which is to be immunized. Injected alone, the serum produces temporary immunity. By injecting a small quantity of a culture of hog cholera germs at the same time the serum is injected, the immunity is made to last for a long while, if not permanently. The blood of the hyper-immunized hog is drawn some 8 or 10 days after he is given the hyper-immunizing dose. It may be drawn several times thereafter, only a very short section of his tail being cut off each time. A large hog is best suited for the purpose of producing immune blood. The amount of blood drawn from different hogs differs, but is always comparatively small. The amount of the serum to be injected into the hog to be immunized is not settled positively, but good results have been gotten by injecting 20cc or 5 teaspoonsful with 1 to 2 cc. of the culture. The operation of immunizing a hog may be performed with the use of an ordinary blackleg syringe, and is not more difficult than preparing and administering blackleg vaccine. The principle hindrance to the general use of the immunizing method is the difficulty of getting the necessary amount of serum from immune hogs. If it is possible to produce a suitable serum in hogs, in which case much larger quantities may be procured, the method may be put into general practice. Unless this can be done, the process of immunizing must of necessity be too slow for general use in a wide spread outbreak of hog cholera. Even now, the use of this method is of the greatest value, laying the foundation for breeding hogs immune from cholera.

BREEDING HOGS IMMUNE FROM CHOLERA.

It was demonstrated some years ago by Dr. A. T. Peters, of the Nebraska Experiment Station, that by beginning with immune sows, hogs could be bred immune from cholera. The method has been successfully followed by farmers in this State. There is no room for doubt about the success of the method. The only difficulty will be to get hog raisers to put it into general practice.

This method consists in beginning with immunized sows and feeding them the germs of hog cholera once, two weeks before and twice at intervals of two weeks after farrowing. Immune sows with which to begin this method may be secured in two ways: (1) By selecting hogs that have gone through an outbreak of the cholera and either recovered or did not take it; (2) by immunizing sows artificially as explained above. The germs with which to feed the sows under treatment, are present in the flesh of a hog which has died of cholera and this flesh may be used. It is sometimes very difficult to obtain the flesh of a diseased hog. On that account it will be necessary to use an artificial culture. The authorities of the Missouri Experiment Station have agreed to keep a culture of hog cholera germs and send out supplies to those who desire to make use of this method.

TUBERCULOSIS.

During the past year the tuberculin test was administered to 30 herds of cattle, in six of which tuberculosis was found. A total of 702 head of cattle were tested, of which 32 head, or 4.5 per cent, were found diseased. In all cases the accuracy of the test was verified by post-mortem examinations. The herds tested were well distributed over the State. Within the last year cattle affected with tuberculosis, shown by post-mortem examination, were received at the public markets from Windsor, Bronaugh, Sturgeon, Hallsville, Lebanon and Columbia. Hogs diseased with tuberculosis were received at the public markets from Westboro, Tarkio, Iantha, Clearmont, Wayland, Raymore, Mosby, Skidmore, Boonville, Centerview, Garden City and Centralia. As a rule, hogs and cattle, after being purchased by the packers, are lost trace of, and it is only in rare cases that accurate information concerning the point of origin of diseased stuff can be definitely ascertained. The number of cases reported to this office must, therefore, be only a small per cent of the total number of shipments of diseased hogs and cattle from this State. The results of the inspection of herds over different parts of the State and the receipt of so much tuberculous stock at the public markets shows tuberculosis to be prevalent over the State. The number of cattle and hogs found diseased with tuberculosis last year, both by the test and in the meat inspection, was so much greater than in previous years as to indicate a rapid spread of this disease.

Among the cattle tested during the last five years, individuals diseased with tuberculosis were found coming direct from six prominent registered herds of this State. Diseased individuals were traced directly to as many prominent registered herds in other states. Very few of the breeders of registered herds have, up to this time, taken any effective precaution to prevent the introduction of tuberculous cattle into their herds. The tuberculin test, the only accurate means of ascertaining whether or not an animal is diseased with tuberculosis, has been neglected almost altogether. But one result could possibly follow, viz.: All permanent herds, to which individual animals are added from time to time, have been left open to infection, and many of them have actually become infected. These herds, in turn, send out breeding animals to be used in improving scrub herds, which, in many cases, carry tuberculosis with them. Tuberculous cows from one registered herd of dairy cattle have been found in three dairy herds of the State and were the first infected animals in two of these herds and apparently so in the third. It is no longer safe for any person, with a permanent herd of beef or dairy cattle, to add animals to it without first testing them with tuberculin. This is especially true of dairymen, who must soon either keep cows free from tuberculosis or go out of the dairy business. The general use of the tuberculin test, and that alone, will stop the spread of tuberculosis among cattle.

During the past few years the tuberculous cattle that were found in a number of different herds were taken out and the premises disinfected. A subsequent re-test showed these herds to be free from tuberculosis. In a number of herds, where the disease was badly spread among the cattle, those affected were either isolated *or killed*, as their value justified, and by the use of care the disease is being stamped out. There is no herd so badly diseased with tuberculosis but that with a small indemnity from the State for those animals which it is necessary to slaughter, it will be cheaper to the owner and to the State to stamp the disease out than to leave it in. The fact that tuberculosis can be stamped out of any herd has been thoroughly demonstrated. To let it exist in any herd within this State is the falsest kind of economy.

The tests of dairy cattle made so far, although limited in number, have revealed a condition of affairs in some dairies that is truly repulsive. In one case, some 27 cows and heifers were found diseased with tuberculosis. Some 20 head of the diseased cows were being milked and the milk shipped to St. Louis. Five of these cows showed marked clinical symptoms, such as the most filthy abscesses about the throat and, in one case, in the udder. The milk from these diseased cows was shipped to a milk dealer in St. Louis, mixed in a vat with his general supply and thence distributed over the city. While the diseased cows in this herd were still in use, their owner became very ill with symptoms of tuberculosis and later on died. Another notable case was one in which a high class dairy was furnishing milk to wealthy residents of the West End in St. Louis at a fancy price. Although the cows were apparently healthy, the test shows about half of them to be diseased with tuberculosis. Post-mortem examination on all condemned showed all to be diseased. About one-half of the number condemned showed extensive lesions on post-mortem, including large pockets of pus among the internal organs. The examination of dairy cattle over the State has gone far enough to show, beyond a doubt, that *the general milk supply of St. Louis, Kansas City, St. Joe, and many of the smaller cities of this State, is contaminated* with milk from cows diseased with tuberculosis.

All scientific investigation indicates that bovine tuberculosis is transmitted to man. The circumstantial evidence in the case shows that a large part of the tuberculosis among human beings is contracted by the use of the milk of tuberculous cattle. For instance, we know that in St. Louis the use of milk from tuberculous cattle is general. We know that there is a very large number of cases of human tuberculosis in St. Louis. Some years ago an anti-spitting ordinance was passed by the city, and other precautions taken to remove what were supposed to be the most fruitful sources of tuberculosis infection. After all has been done, the death rate from tuberculosis is still enormous. It is not confined to the poor who live in unkept tenement houses. It invades the most sanitary homes. The question is, "Where does this infection come from?" Some answer to this question should be given. The neglect to search for the source of infection causing so great a loss of human life amounts to criminal carelessness on the part of those who are in official positions. It is not a matter to admit of parley and delay. If it is impossible to discover exactly which source of infection is the most dangerous to the human family, we ought to proceed without debate to remove *all sources of infection,* as an army would close all doors of its fortress against the enemy. The annual death rate from tuberculosis in Missouri can not be given at less than 4,000. This State is paying out not less than $600,000 annually, nursing and burying consumptives. It is the consensus of opinion of scientists that tuberculosis in the human family comes largely from cattle. The milk supply of this State is now in such a condition as to be easily responsible for one-half of the deaths from tuberculosis in the human family. For that reason, if for no other, this disease ought to be stamped out of our dairy herds.

In all of the work of testing cattle, we have tried to be careful, accurate and fair with the owner. Whenever there has been any doubt about the results of a test, we have always given the owner the benefit of that doubt. We have made it a practice to retest animals that were especially valuable, in order to make doubly sure of no errors. We have always invited the owner of condemned cattle to witness the post-mortem examination of such animals as were slaughtered. We have issued permits for the shipment for immediate slaughter, subject to inspection, of all scrub stuff. Whenever valuable breeding animals have been condemned, their owner has been given full and careful instruction as to handling them and breeding them in such a way as to protect his herd and still get the use of his diseased animals. It has been the rule in this work to protect those who were unfortunate enough to own diseased cattle from undue notoriety. Among those who have had their herds tested there is practically nothing but good will.

LEGISLATION.

As the law stands, very little can be done by way of controlling tuberculosis. All the work, so far, has been of a desultory nature, this department making tests whenever there was an opportunity. The requests for the test have, of necessity, been voluntary. No attempt has been made to force the test on anybody, there being no authority to do so. The voluntary requests for the test have been comparatively few. The reason is very apparent. As the law stands, all that can be done is to test a herd and place the diseased animals in quarantine. The doubtful authority to permit their shipment to market for immediate slaughter has been exercised. Even with this, the owner, of dairy cows especially, gets almost nothing for them. The loss is so great that it would be the financial ruin of many who own tuberculous herds to have them tested under the present law. In the last Legislature bills adding the word "tuberculosis" to the statutes were defeated by the Senate committee on agriculture. The effect of the law, if it had been so amended, would have been to pay an indemnity for cattle condemned on account of tuberculosis, as is now done in case of horses condemned on account of glanders. It is well known that the majority of the dairymen of the State are willing to have their herds tested, and are anxious, once for all, to get clear of all tuberculosis in their herds. This they can not do now without facing financial ruin. The law must be amended to provide for indemnity before any effective work can be done. The policy of coersion is a doubtful one. It seems wise to arrange the law so as to provide for indemnity and let the requests for the test remain voluntary for at least two years. It is reasonably certain that a majority of the dairymen, under such conditions, would have their herds free from tuberculosis within two years. Then the public, by making a little inquiry, could at least get dairy products that are wholesome. The few, however, who would neglect to clean up their herds and continue to sell diseased milk, would remain a menace to milk consumers and a disgrace to the dairy industry. If necessary, after two years' work, laws could be passed requiring all dairy cattle to be tested. If a law is passed off-hand, requiring all dairy cattle tested, it must also provide for a liberal indemnity to be promptly paid. Some law, making it possible to proceed with the eradication of so great a scourge, is an absolute necessity.

APPROPRIATION.

Heretofore, the appropriation for the control of contagious diseases of live stock has been so small as to prevent effective work. As a result of too much economy, immense losses have occurred. The appropriations have in no way been commensurate with the vast live stock interest of this State. At the last session of the general assemblies of those states, Minnesota appropriated $170,000.00 and Pennsylvania, $135,000.00 for control work. Other states have appropriated money almost as liberally. At a sale in Missouri last year, 2 pigs sold for over $9,000.00. The appropriation by the great State of Missouri for the control of all the contagious diseases of all animals for the year was $8,100.00. This State ought to appropriate at least the value of 20 of the best pigs in the State, and of 10 head of cattle, for controlling the many contagious diseases of the domestic animals.

Respectfully,
D. F. LUCKEY,
State Veterinarian.

REPORT OF STATE HIGHWAY ENGINEER.

Columbia, Mo., December 17, 1907.

Mr. President and the Honorable Members of the State Board of Agriculture:

Since assuming office on July 6th, I have devoted two-thirds of my time to two of the three proposed cross-state roads from Kansas City to St. Louis. The idea which first went abroad that the State was to build this road, created much enthusiasm, which was greatly lessened after the facts were understood. There still remain enough genuine advocate of this movement to eventually bring results. The idea is to build these roads by the organization of road districts under the "benefit assessment" law. Five proposed districts, comprising in all about 50 miles of road, are in different stages of organization. The publicity given these roads has done much in the agitation for better roads.

During the time not devoted to the cross-state roads, I have been fully employed with other roads of the State. Besides inquiries answered by mail, I have made personal trips for investigation to Troy, Elsberry, Steedman, Springfield, Raymore, Belton, Marshfield, Billings, Neosho, Odessa, Norborne and Van Buren. Places which have made calls and now await a personal trip are Gazette, Novelty, Savannah, Oregon, Holden, Hardin and Gainsville.

Estimates of cost have been made for 18 miles of road at Troy, 6½ miles at Elsberry and 6 miles at Steedman. I am drawing up specifications and forms of contract for 5½ miles at Springfield and 18 miles at Raymore. Have had made a complete field survey and am working on plans, estimates, specifications and contract for 4 miles of road at Pleasant Hill. The calls to Marshfield, Billings and Neosho were to assist in devising some method for general improvement of the surrounding roads; to Odessa, for consultation in the formation of a benefit district for the purpose of making a graded earth road and construction of permanent culverts; and to Norborne, to investigate draining a road through low grounds. A survey has been made and when time permits, I shall make an estimate and draw plans and specifications for bridging the Current river at Van Buren.

There is considerable unfinished work on hand, and where it has been necessary to have assistants, I have employed them. The cost of this assistance to date amounts to $83.35, which I have submitted, with receipts, in my expense account. Until such time as a deputy is required, this method can be used with less expense than the employment of a regular assistant.

As I now view the situation the engineer must, for the present, devote his time to organizing counties under the new road laws; systemizing road work, making and maintaining earth roads and constructing permanent culverts of stone masonry or concrete. It is in this way that we must prepare for, or lead up to, a hard surface on the main roads. All the encouragement and assistance possible should be given to making rock roads, but by far the greater part of the State is not ready for them.

The work has been of such nature as to keep me away from the office, leaving practically no time for the preparation of publication. It is my intention to prepare a bulletin of instructions to the county engineers. This bulletin will call attention to wrong ways now used on working the roads, and will contain general plans and remarks for the care of earth roads. It will contain drawing and plans for concrete and stone masonry culverts, with general items of approximate cost. It will set out and define some of the new road laws, the benefit assessment law, the enactments governing the State road fund and the county highway engineer, with his duties and his relation to the county court. The main feature, however, will be the development of the earth road with permanent culverts and bridges.

I advise the establishment of a road laboratory in conjunction with the University Engineering College. The approximate cost of this will be $800.00. The Board of Agriculture through the road department could pay one-half the cost, or $400. The laboratory is a necessary adjunct to the University in the establishment of a course in road engineering. Aside from the benefits to be derived from training boys in road work, we will then be prepared to test road material from different parts of the State.

Some inducement is necessary to stimulate action toward the more liberal application of rock as a road surfacing.

In a great many places to quarry and crush the rock, in whole or in part, would be considerable aid. This can be done by convict labor, a plan of which I wish to present to the Board.

The State can own quarry and crusher plants, to be operated under State supervision by the less troublesome convicts from the penitentiary. These must be portable plants with some portable means of housing the prisoners, and can be so limited in number as to utilize only the less vicious convicts. Two hundred convicts suitable for this work are now available in the penitentiary, enough to operate ten plants, with an output from each of 60 cubic yards of crushed rock per day, or a total of 600 cubic yards; sufficient during the nine working months of the year, for 70 miles of road.

The cost would be about $5,000.00 per plant, and the care of each prisoner, 40 or 50 cents per day.

The State would soon be more than repaid by the increased revenue derived from the increase in population and the increased valuation of property accruing from good roads.

I do not advocate scattering the convicts out along a road. I would keep them confined strictly to the quarry and crusher plants, and leave hauling the rock and other work necessary to road construction to be performed by the community for which the road is being made. With systematic order of distribution and application for such plants, much assistance can be given in the form of State aid to road work. Were these plants available, I could use four of them when the season opens next spring. As affairs now stand, there may be nothing done. It is my belief, that in less than two years we would have in constant use every plant the State could man.

If such use of convicts is not inconsistent with the view of the Board, I shall make a closer study of the subject and present it in more detail.

Respectfully submitted,

CURTIS HILL,
State Highway Engineer.

REPORT OF THE STATE INSPECTOR OF APIARIES.

M. E. DARBY, SPRINGFIELD, MISSOURI.

Apiares inspected during the season, 1907	215
Apiaries found diseased with foulbrood	82
Colonies inspected	3,028
Colonies found diseased with foulbrood	297

I was appointed State Inspector of Apiaries June 5th, 1907, and when I started on my work, part of the season best suited for the inspection and location of diseased apiaries had passed.

A good deal of my work had to be educational, as most of the bee keepers of our State are not aware that the disease of foulbrood has spread through their apiaries. I had to make long trips from one part of the State to the other to look after apiaries where they were reported diseased, and the traveling expenses on this account were quite heavy.

In some parts of the State nearly every apiary inspected was diseased with foulbrood, and much work is necessary to check the disease in these localities.

It is of great importance that the bee keepers of the State learn to recognize foulbrood when it appears in their apiaries, as great losses can be prevented when foulbrood is detected as soon as it makes its appearance in a locality. Since bees, honey and queen bees are constantly shipped from one place to another the disease is easily spread, unless great care is taken to prevent infection.

Honey which is brought from unknown sources ought not to be fed to bees. When feeding is necessary it is safe to feed syrup made by dissolving granulated sugar in water, using half sugar and half water, thus the danger of feeding honey which may contain the germs of foulbrood is avoided.

When queens are bought from queen breeders, they can be introduced without any danger of infection with foulbrood, even if the queen came from an infected hive, if precaution is taken. Transfer the queen into a new cage provided with sufficient healthy food. Destroy the cage in which the queen came, together with the food and the bees it contains, by burning. The queen itself will never transmit foulbrood, it is done by the bees which are sent with her and the food in the cage.

Bee keepers ought to be very careful in using old hives with comb, from which the bees have died, or in buying second-hand supplies from infected apiaries, as often foulbrood is spread in this way.

SYMPTOMS OF FOULBROOD.

(1) Brood in combs badly scattered, many empty cells, cappings dark and sunken, some with holes in cappings, part of brood hatching while others are dead. The dead larvae of a dark brown color, or blackish according to age. The lightest colored will, upon inserting a toothpick, draw out much like rubber or glue and at that stage has the most odor, much like stale glue when warm.

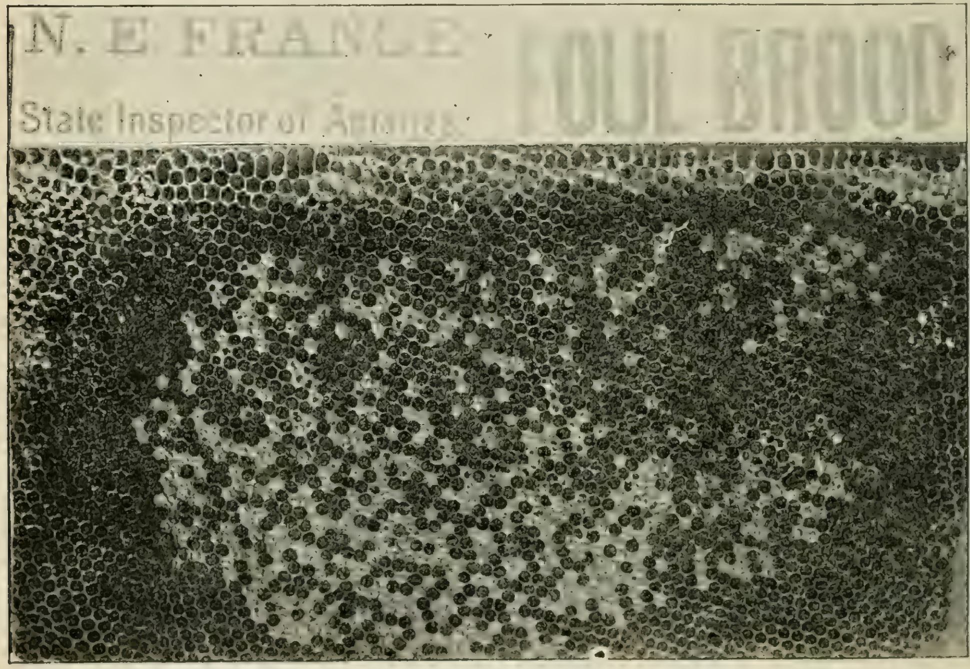


Figure 1. Comb badly affected with Foulbrood. By courtesy of N. E. France, Inspector of Apiaries, Wisconsin.

(2) Dried scales. If the disease has reached advanced stages all of above conditions will be easily seen. According to its age of development, there will be either the shapeless mass of dark brown matter on the lower side wall of the cell or the dried scale. This scale nearly black and dried hard to wall of comb as thin as side wall of the cell. The heat of the larvae often dries in a small bunch and turned up some, in size about half size of pin head.

HOW TO DETECT FOULBROOD.

Take out carefully the oldest hatching brood in the hive, and first see if the cappings are smooth or sunken and scattered, with some having small holes in the cappings. This is more noticeable in old black combs. Now bring the brood comb right side up to the level of your chin, tip the top of the comb towards you so your view strikes the lower walls of the brood cells, about one-third distance from front. Next turn your body so that bright daylight comes over your shoulder and shines in each cell where your view of suspected disease is found. The white line in this picture shows the angle I want the light to come in each brood cell. Gas or electric light will not take the place of sunshine or strong daylight.

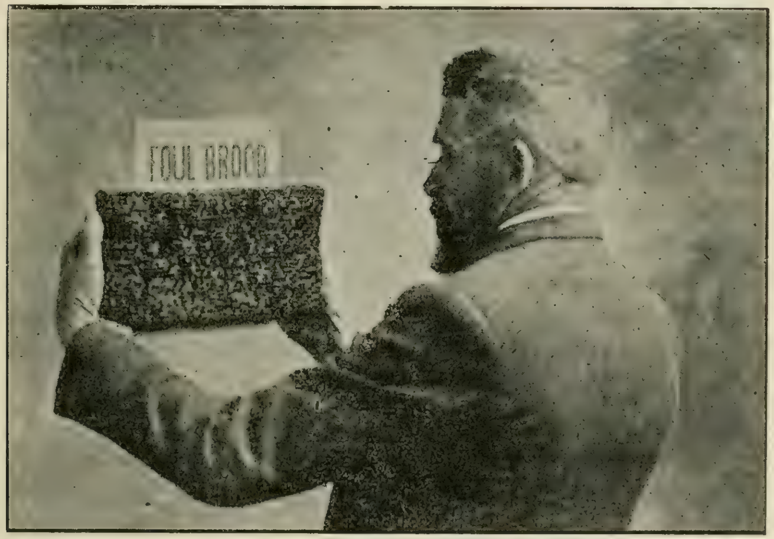


Figure 2. Looking for Foulbrood. By courtesy N. E. France, Inspector of Apiaries, Wisconsin.

On the lower side wall, just back from front end of the cells, will be seen the apparently dead foul brood, nearly black, with a sharp pointed head slightly turned up. The body portion of the bee flattened to a mere black lining of its cells, no thicker than one side wall of the comb cells. The other side walls and bottom of the cell look clean. The scales, if present as described, is a sure proof of foulbrood. Such infected combs must be burned or melted in boiling water, thus killing all disease and saving the wax. Diseased combs melted by sunshine heat will not kill all disease. Always use abundance of boiling water in saving wax from old combs. First melt the combs in large kettle of boiling water, and when all melted and well stirred, is then strained through the wax press, thus saving everything of any value.

TREATMENT.

McEvoy Treatment—"In the honey season when the bees are gathering honey freely, remove the combs in the evening and shake the bees into their own hives; give them frames with comb foundation starters and let them build comb for four days. The bees will make the starters which they took with them from the old comb. Then in the evening of the fourth day take out the new combs and give them comb foundation (full sheets) to work out, and then the cure will be complete. By this method of treatment all the diseased honey is removed from the bees before the full sheets of foundation are worked out. All the old foulbrood combs must be burned or carefully made into wax after they are removed from the hives, and all the new combs made out of the starters during the four days must be burned or made into wax, on account of the diseased honey that would be stored in them. All the curing or treating of diseased colonies should be done in the evening, so as not to have any robbing done, or cause any of the bees from the diseased colonies to mix and go with the bees of healthy colonies. By doing all the work in the evening it gives the bees a chance to settle down nicely before morning, and then there is no confusion or trouble.

TO PREVENT SWARMING OUT WHEN TREATED.

This same method of curing colonies of foulbrood can be carried on at any time from May to October, when the bees are not getting any honey, by feeding plenty of sugar syrup in the evenings to take the place of the honey flow. It will start the bees robbing and spread the disease to work with foulbrood colonies in warm days when the bees are not gathering honey, and for that reason all work must be done in the evening when no bees are flying.

When the diseased colonies are weak in bees, put the bees two, three or four colonies together, so as to get a good-sized swarm to start the cure with, as it does not pay to spend time fussing with little weak colonies. When the bees are not gathering honey, any apiary can be cured of foul brood by removing the diseased combs in the evening and giving the bees frames with comb foundation starters on. Then, also, in the evening feed the bees plenty of syrup, and they will draw out the foundation and store the diseased honey which they took with them from the old combs; on the fourth evening remove the new combs made out of the starters and give the bees full sheets of comb foundation and feed plenty of sugar syrup each evening until every colony is in first class order. Make the syrup out of granulated sugar, putting one pound of water to every pound of sugar, and bring it to a boil. As previously stated, all old combs must be burned or made into wax, and so must all new combs made during the four days. No colony is cured of foulbrood by the use of any drug."

All the difference from the McEvoy treatment that I practice —I dig a deep pit on level ground near the diseased apiary, and after getting a fire in the pit, such diseased combs, frames, etc., as are to be burned are burned in this pit in evening, and then the fresh earth from the pit returned to cover all from sight. Often I use some kerosene oil, a little at a time being poured on old brood combs or those having much honey in, as they are hard to burn. If diseased combs with honey in are burned on the surface of the soil there is great danger, the honey when heated a little will run like water on the soil and in the morning the robber bees will be busy taking home the diseased honey that was not heated enough to kill germs of foulbrood.

I also cage the queen while the bees are on the five or six strips of foundation. It helps to keep the colony from deserting the hive and going to other colonies.

GETTING RID OF FOULBROOD.

Baldridge Treatment—"I am positive that I know how to get rid of foulbrood in my own apiary and I see no reason why others can not do likewise. I think my plan is so very simple and practical that any bee keeper, though a novice, can adopt it, and with the best of results. In the first place I cage the queen of the diseased colony so as to stop breeding, and then place the caged mother in the top of the hive where the bees can have ready access to her, and likewise so I can get possession of the cage when needed, and with the least possible disturbance of the bees. I then bore a hole —say an inch in diameter—in the front end of the hive, a few inches above the bottom entrance, and fasten a metal bee-escape over the hole and on the outside of the hive. I do the foregoing towards sunset and then let the colony alone until the next morning.

I now prepare an empty hive by filling the brood-chamber with a set of frames—less one or two—filled with foundation or simply narrow strips of the same. I now go to any strong, healthy colony and remove one or two combs of brood, with or without the adhering bees, and place the same in the prepared hive.

I now gently as possible reverse the diseased colony, or turn it end for end, and move it sidewise the width of the hive, or a trifle more, and leave the bee entrance open—when this is done I then place the prepared hive on the old stand, but with its bee-entrance in the opposite direction. This may all be done any time in the forenoon or when the bees are busy getting honey from the flowers. The bees will now, on their return from work, or play, enter the prepared hive and remain there, and within two or three days the main force of the matured bee will be transferred to their old location.

Now towards sunset blow a few puffs of smoke upon the caged queen, to drive the bees away from it, and then transfer the queen to the colony in the prepared hive. She may be given her liberty at once and by way of the bee-entrance. Now close the bee-entrance to the diseased colony so that no bees can pass in nor out except through the bee-escape, and gently reverse the hive again so that both hives will now front the same way. Both hives should now set close together or within an inch or so of each other. From now on all the bees in the diseased colony must pass out or through the bee-escape, and, as they can not return, they must and will go into the prepared hive. In about three weeks all the healthy brood in the diseased colony will be hatched out and soon thereafter all the bees will be found in the prepared hive—and no loss of either bees or labor. The contents of the diseased colony may now be taken to some proper place and be disposed of by burning the same. This is best done in a room or building to which no outside bees can gain access and get at the honey. But it is not necessary that this should be a total loss. Such combs as contain honey and are free of diseased brood may be extracted and saved for table use, and the empty combs melted and made into wax—those that contain brood may as well be burned up at once—frames and all— as the cost of replacing them nowadays is but a trifle anyway.

By this time the prepared hive will or should be full of both comb and brood and without any foul brood or any trace of the disease. In fact it will be and remain a healthy colony. At least that has been my experience for thirty years.

The now empty hive may, by simply scraping it thoroughly, be used again with no occurrence of the disease.

The foregoing treatment of foulbrood malady is based upon the generally accepted theory, which I indorse, that the honey in the combs of a foulbrood colony is more or less impregnated with the germs of the disease. The manipulation given simply but successfully transfers all the bees—nurse-bees included—from the foulbrood colony to another hive free from disease, and without any of the diseased honey in their bodies, nor in the food the nurse-bees may have in their stomachs. All the nurse-bees by this plan remain in the diseased colony until their baby-food becomes exhausted, and the method outlined is the only one I am acquainted with that secures this result when the combs of the diseased colony are filled with brood in all stages of its growth.

To conclude: As soon as foulbrood is found to exist in an apiary please don't get excited nor foolish, and thereupon burn or otherwise destroy the entire apiary. The better way by far is to ascertain as speedily as possible how many colonies are diseased, mark them, and then let them severely alone until the proper time arrives to treat them. Do not open such hives nor handle the combs unless absolutely necessary, and then use care that no robber bees get a chance to steal and carry off more or less of the honey."

The careful bee-keeper who keeps everything cleaned up in his apiary and is very careful, this last method of treatment during honey harvest will give satisfaction. Be sure the brood combs from other swarms are healthy and a good bee-escape is at hive entrance so no bees can return through it. I use the Porter bee-escape just above entrance, which is nailed closed. Read very carefully Mr. Baldridge's method and follow it to the letter.

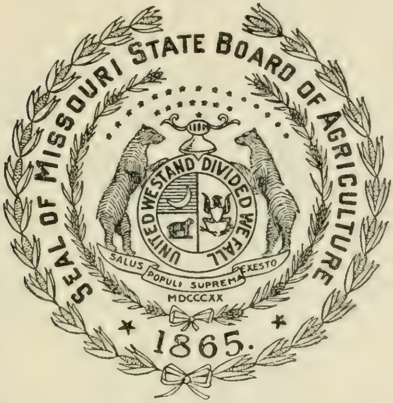
THE PART OF THE APIARY LAW INTERESTING TO BEE-KEEPERS.

Sec. 2. Said inspector shall, when notified of the existence of the disease known as foul brood, or other infectious disease among apiaries, examine such reported apiaries and all others in the same locality, and if satisfied of the existence of foul brood, or any other infectious disease, shall give to the owner or person having charge of any such apiary full instructions as to the manner of treating them. Within a reasonable time after making the first examination, the inspector shall make a second examination, and if the conditions of any of the colonies affected is such as, in his judgment, renders it necessary, he may personally treat the disease, or, if in his opinion, it is necessary to prevent further spread of the disease, and the owner refuses to treat them according to the instructions of said inspector, then the inspector may burn or otherwise destroy such diseased bees, comb or other material that might cause the spread of the infection.

Sec. 3. Said inspector shall have the right to enter any premises where bees are kept, for the performance of his duties.

Sec. 6. Any owner of a diseased apiary, or any person, persons, company or corporation who shall knowingly sell, barter, give away or import into this State any colony or colonies of bees, honey or other article infected with disease, or expose other bees to the danger of contracting such disease, or refuse to allow the apiary inspector to inspect or treat such apiary, honey or other articles so infected, or shall resist, impede or hinder him in any way in the discharge of his duties, under the provisions of this act, shall be guilty of a misdemeanor, and shall be fined not less than ten nor more than twenty-five dollars for each offense.

SEAL OF MISSOURI STATE BOARD OF AGRICULTURE.

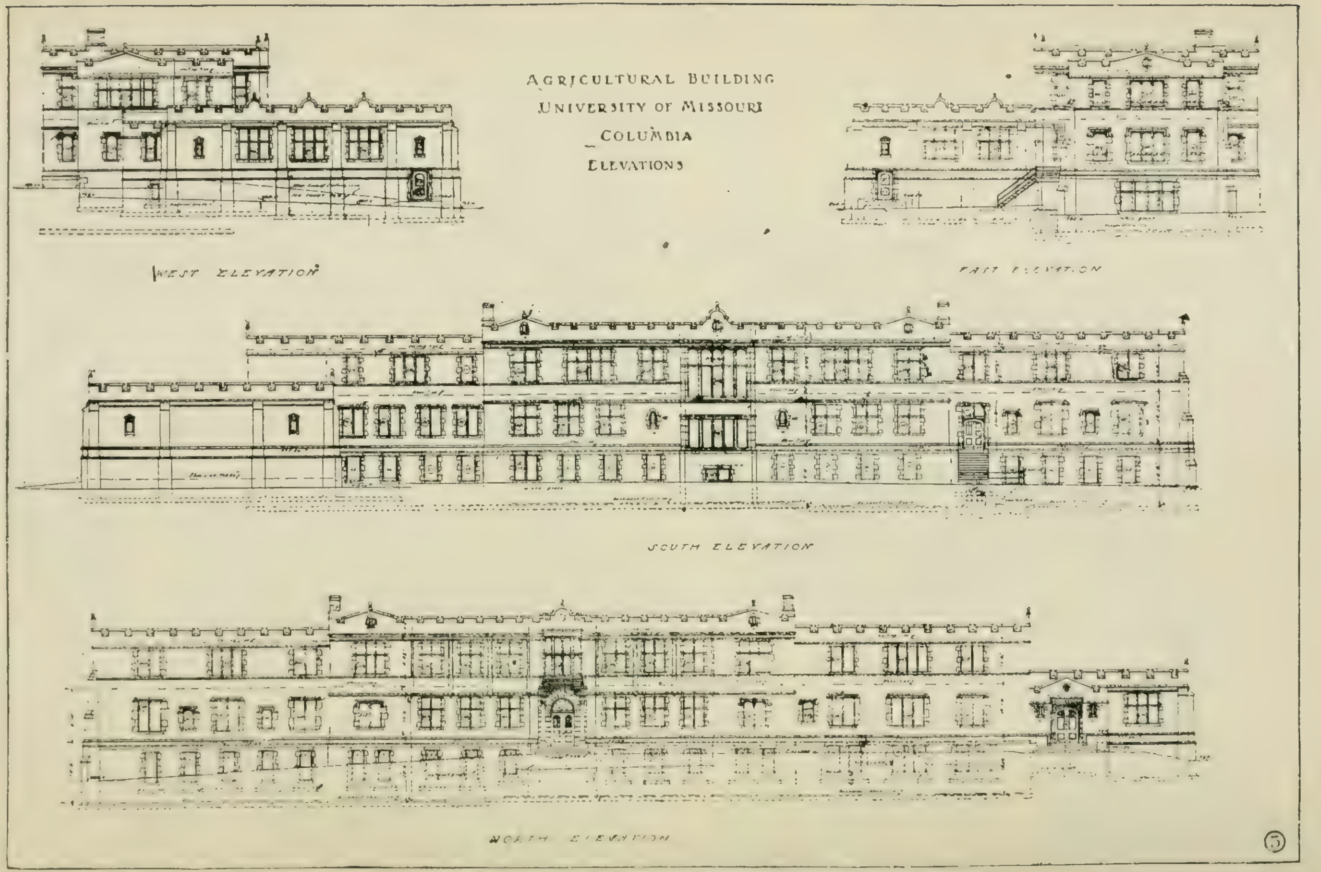

SEAL OF MISSOURI STATE BOARD OF AGRICULTURE
UNITED WE STAND DIVIDED WE FALL
SALUS POPULI SUPREMA LEX ESTO
MDCCCXX
1865.

The Missouri State Board of Agriculture was organized under the laws of the State, March 13, 1865. The Board is authorized to adopt a common seal by section 4697, R. S. 1899:

"A Board of Agriculture is hereby instituted and created a body corporate by the name and style of 'The Missouri State Board of Agriculture,' and by that name shall have perpetual succession, power to sue and be sued, complain and defend in all courts, to make and use a common seal and alter the same at pleasure."

No seal, however, had been adopted until on February 1, 1908, the Secretary, under previous order of the Board, submitted a design, consisting of the Great Seal of the State for the center, circled by a wreath of wheat-heads, which in turn is circled by the lettering "Seal of Missouri State Board of Agriculture * 1865 * ", with a wreath of corn ears in the husk on the outer edge of the seal."

At a called meeting of the Board, held in Kansas City on February 1, 1908, the above design was adopted as the official seal of the Board.


AGRICULTURAL BUILDING
UNIVERSITY OF MISSOURI
COLUMBIA
ELEVATIONS
WEST ELEVATION
EAST ELEVATION
SOUTH ELEVATION
NORTH ELEVATION
⑤

THE AGRICULTURAL BUILDING, TO BE COMPLETED MARCH 1, 1909.

Farmers' Week in Agricultural College.

January 7, 8, 9, 10, 1908.

Fifth Annual Meeting Missouri Corn Growers' Association, Eleventh Annual Meeting Missouri Improved Live Stock Breeders' Association, Eighteenth Annual Meeting State Dairy Association, Second Annual Meeting Missouri State Sheep Breeders' Association, First Annual Meeting Missouri Swine Growers' and Breeders' Association, and First Meeting Missouri Housekeepers' Conference.

(*Conducted under the auspices of State Board of Agriculture.*)

AN ABSTRACT OF THE ADDRESSES DELIVERED.

HISTORICAL.

Farmers' Week in the Agricultural College is the outgrowth of the meeting of the State Industrial Associations formerly held in various places under the auspices of the State Board of Agriculture. Believing that a greater amount of good could be accomplished by bringing the farmers in closer contact with the work of the Agricultural College and Experiment Station, the Board of Agriculture decided, in 1904, to unite all farmers' organizations possible into one great Farmers' Convention held annually in Columbia during the first week in January. The wisdom of this course has been demonstrated by the greatly increased attendance at these meetings each succeeding year, as well as by the increased interest of the farmers generally in the work of the Experiment Station.

It is not possible to give an exact report of all the meetings held, but the most instructive papers and discussions thought to be of practical benefit to our farmers are published.

SWINE GROWERS' SESSION.

Tuesday, January 7, 1908.

A RESUME OF THE EXPERIMENTAL WORK WITH HOGS DONE AT THE IOWA EXPERIMENT STATION.

(Prof. Wayne Dinsmore, Iowa Agricultural College.)

This subject is so broad that I have decided to confine myself chiefly to the more recent work completed at the Iowa Station. The experiments to which I wish to give most attention have been coducted within the past six years. The principal objects sought in these investigations have been:

"1. To compare with each other and with a ration of corn alone, rations made up of corn with certain supplementary feeds richer in protein. Barley, wheat shorts, meat meal and tankage were the supplements used."

2. "To compare rations composed of corn and varying proportions of these supplemental feeds."

3. "To compare dry lot and pasture feeding of hogs."

4. "To compare timothy and clover pasture."

The preliminary experiment was conducted in 1902, and while by no means an extensive one, gave evidence which indicated that the supplemental foods increased the rate of grain, and were well worth their cost. No difference of note was discernible in the appearance of the finished hogs and all sold for the same price on the market.

This preliminary experiment aroused great interest, and as the results could by no means be considered conclusive, more complete tests were determined upon. These were conducted during 1905 and 1906, and are reported in Bulletin 91. Altogether, 18 lots were used, including a total of 184 pigs, varying in weight from 31 to 291 pounds at the beginning of the tests. Twelve of these lots were fed in dry yards and six on pasture. Four lots were fed in midsummer, four in spring, and ten during the late summer and fall.

It is manifestly impracticable to go into any considerable detail in this review, and I shall therefore consider only the general results obtained.

The rations fed to the various lots, and number and weight of the pigs in each lot, is herewith given:

FIRST EXPERIMENT.

		Nutritive ratio.
Lot 1.	Corn two parts, barley one, wheat shorts one	1:7.1
" 2.	Corn	1:8
" 3.	Corn nine, Armour's meat meal one	1:4.7
" 4.	Corn nine, Swift's tankage one	1:4.8

The feeding was begun June 8th and extended to July 10th, a period of thirty-two days.

Twelve pigs in each lot. Average weight 218 pounds.

SECOND EXPERIMENT.

		Nutritive ratio.
Lot 1.	Corn meal seven parts, meat meal one	1:4.8
" 2.	Corn meal eight and one-half, meat meal one	1:5.2
" 3.	Corn meal ten parts, meat meal one	1:5.5
" 4.	Corn meal alone	1:9.1

Nine pigs in each lot. Average weight 137 pounds. Fed 100 days.

THIRD EXPERIMENT.

(*Six lots, fed on pasture.*)

No. of pigs.		Kind of pasture.	Concentrates, parts by weight		Nutritive ratio.	
			Corn.	Supplements.	Concentrates.	Pasture.
Lot 1	10	Timothy	Corn meal		1:8.4	1:5.7
" 2	10	"	" 2	Shorts 1	1:6.8	1:5.7
" 3	10	"	" 1	" 1	1:6.2	1:5.7
" 4	10	"	" 5	Meat meal 1	1:3.8	1:5.7
" 5	10	"	" 5	Tankage 1	1:3.9	1:5.7
" 6	10	Clover	"		1:8.4	1:4.2

(*Four lots, fed in dry yard.*)

Lot 7	10		Corn meal 2	Shorts 1	1:6.8	
" 8	10		" 1	" 1	1:6.2	
" 9	10		" 5	Meat meal 1	1:3.8	
" 10	10		" 5	Tankage 1	1:3.9	

Ten pigs in each lot. Average weight, 59.6 pounds. Fed 112 days.

The summary of gains for the above lots is as follows:

FIRST EXPERIMENT.

Summary.	June 8.	July 10.	Gain per head, 32 days.	Daily gain.	Total gain per lot.
Lot 1—12 hogs......................	221.7	292.5	70.8	2.213	849.9
" 2— "	213.4	273.6	60.2	1.88	722.1
" 3— "	222.6	308.5	85.9	2.685	1031.
" 4— "	214.4	289.3	74.9	2.341	899.
Four lots...........................	218.	291.	73.	2.28	3502.0

"The meat meal and tankage apparently increased the palatability of the ration, for while all the lots were started on a ration of 6.3 lbs. per head daily, June 8th, and gradually increased till all the hogs were getting 8.8 pounds each June 18th, and from that time on lots 3 and 4 showed a willingness to take more feed than the other lots. The hogs getting meat meal and tankage as 10 per cent of their ration, with corn, ate practically one pound each daily of the supplementary feed."

SECOND EXPERIMENT.

	Parts of corn to one part meat meal....	Average weight at beginning, March 13.	Daily gain per pig by periods.				Av. daily gain during 100 days, March 13 to June 2..........	Total gain per pig in 100 days..........	Average final weight June 21..............
			1	2	3	4			
			March 13 to April 11.	April 11 to May 10.	May 10 to June 7.	June 7 to June 21.			
Lot 1..........................	7.	136.3	1.834	1.697	1.779	1.614	1.748	174.8	311.1
" 2..........................	8.5	140.2	1.769	1.959	1.696	1.643	1.786	178.6	318.8
" 3..........................	10.	137.1	1.693	1.983	1.880	1.900	1.858	185.8	322.9
" 4, corn alone...........	....	134.9	.772	1.259	1.239	1.621	1.163	116.3	251.2
General average...........	....	137.1	1.518	1.725	1.647	1.692	1,639	163.9	301.0

WEIGHTS AND GAINS OF PIGS IN POUNDS PER LOT.

(Third Experiment. Table No. 4.)

Lots 1 to 6 fed on pasture.	Average weight at beginning, July 24	Daily gain per pig in four periods of 28 days.				Average for 112 days, July 24 to Nov. 13.		Average final weight November 13	Total gain per lot during 112 days
		1	2	3	4				
Feeds.		July 24 to Aug. 21	Aug. 21 to Sept. 18	Sept. 18 to Oct. 16	Oct. 16 to Nov. 13	Daily gain per pig	Total gain per pig		
Lot 1. Corn (timothy pasture)	59.9	0.743	0.954	1.120	0.878	0.923	103.4	163.3	1034.2
" 2. Corn 2, shorts 1 (timothy pasture)	59.8	.881	1.121	1.168	1.311	1.120	125.5	185.3	1254,7
" 3. Corn 1, shorts 1 (timothy pasture)	59.8	.986	1.134	1.177	1.462	1.180	133.2	193.	1332.5
*" 4. Corn 5, meat meal 1 (timothy pasture)	60.1	.967	1.216	1.357	1.440	1.237	138.5	198.6	1282.2
" 5. Corn 5, tankage 1 (timothy pasture)	60.1	1.082	1.338	1.621	1.455	1.374	153.9	214.	1539.0
" 6. Corn (clover pasture)	59.9	.929	1.189	1.443	1.212	1,193	133.7	193.6	1336.6
Lots 7 to 10 in dry yards.									
Lot 7. Corn 2, shorts 1	59.3	.605	.650	.864	1.129	.812	90.9	150.2	909.4
" 8. Corn 1, shorts 1	59.1	.610	.757	.893	1.318	.894	100.2	159.3	1001.8
" 9. Corn 5, meat meal 1	58.9	.810	.957	1.271	1.311	1.087	121.8	180.7	1217.9
" 10. Corn 5, tankage 1	58.8	.721	.755	1.050	1.132	.915	102.5	161.3	1025.0
All lots	59.6	.833	1.005	1.195	1.263	1.074	120.1	179.7	11933.3

*Lot 4 had ten pigs for the first period, afterwards only nine.

In all of this work it has been noticed that the rate of gain increases with the increase in age and weight of the pigs. Thus the most rapid gains secured were for a short feeding period with hogs averaging 218 pounds at the start. The most rapid gains secured were 2.685 pounds per head daily on the heavy hogs referred to in a short fed lot receiving corn and meat meal in proportions of nine to one, with a nutritive ratio of 1:4.7.

All the tests show that the rations of corn with some supplemental feeds give more rapid gains than rations of corn alone, so far as dry lot feeding is concerned. This holds true even with the nearly mature, heavy hogs, where the corn ration might reasonably be expected to show to the best advantage. All of the supplemental feeds mentioned as used, increased the protein, and all increased the efficiency of the ration in the production of gains.

In the one experiment made in pasture feeding, the rate of gain was increased on the addition of supplemental feeds to a basal ration of corn on timothy pasture. It does not appear, however, to have risen proportionately, for lot 5, on ration with a nutritive ratio of 1:3.9, made slightly greater gains than lot 4, with a nutritive ratio of 1:3.8. This result would indicate that we had passed the maximum point of gain from the use of supplemental feeds, but as a matter of fact, some of the pigs in lot 4 were unthrifty, so that we cannot yet say that a ration of 1:3.8 on timothy pasture, is too narrow for maximum gains. The lot on corn and clover made greater gains than the lots on timothy pasture, corn and shorts, and nearly as great gains as the lots on timothy pasture, corn and meat meal or tankage.

The supplements are, therefore, most effective in supplementing corn in dry lot feeding.

The proportion of meat meal or tankage which should be used cannot, as yet, be considered settled. Very heavy gains were secured in the perliminary test where these were used in the proportions of 1 to 5 of corn. Still greater gains were secured in the test with heavy hogs when meat meal or tankage constituted but one-tenth of the ration. In the second experiment, where tankage was fed in the proportions of 1 to 7, 1 to 8.5 and 1 to 10 of corn, the greatest and most profitable gains were secured in the lot receiving but 1 pound of meat meal to 10 of corn. Later experiments may or may not coincide with this. At present it appears that with fattening hogs, weighing 137 at the start, 1 pound of tankage to 10 of corn is better than larger amounts; and therefore, with these supplements, that a nutritive ratio of 1:5.5 is more satisfactory than narrower ones.

In comparing dry lot and pasture feeding, the latter has given decisively favorable results. The following table shows the lots in the third experiment, according to total gains. Lots 4 and 10 are omitted, as their results were unquestionably misleading, owing to unthrifty individuals.

LOTS ARRANGED ACCORDING TO GAIN.

(Third Experiment. Table No. 8.)

Lots	Concentrated feed.	Total gain	Total concentrates consumed.	Concentrates per 100 lbs. gain	Nutritive ratios of concentrates.	Kind of pasture
5	Corn 5, tankage 1	1539.	6131.	398.4	1:3.9	Timothy
6	Corn alone	1336.6	5562.	416.1	1:8.4	Clover
3	Corn 1, shorts 1	1332.5	5304.	398.	1:62.2	Timothy
2	Corn 2, shorts 1	1254 7	5143.	409.9	1:6.8	Timothy
9	Corn 5, meat meal 1	1217.9	4993.	409.9	1:3.8	None
1	Corn alone	1034.2	4669.	451.4	1:8.4	Timothy
8	Corn 1, shorts 1	1001.8	4785.	477.6	1:6.2	None
7	Corn 2, shorts 1	909.4	4654.	511.8	1:6.8	None

To quote directly from Bulletin 91:

PORK PER ACRE OF GRASS.

"By comparing the lots fed similar rations in dry yards and on grass, we can obtain a very close estimate of the amount of gain by the pigs which is directly credited to the grass. Lot 2 on pasture ate 5,143 pounds of corn and shorts, of which 511.8 pounds would have produced 100 pounds gain if fed to lot 7, making a total of 1,004.9 pounds gain. Lot 2 gained 1,254.7 pounds, or 249.8 pounds more than the corn and shorts alone would have produced. In like manner the grass of the other lots accounts for 221.9 pounds gain for lot 2, 0.9 pounds for lot 4, and 207.4 pounds for lot 5. Lots 4 and 10 were manifestly lower in thrift as compared with the other lots, so it is probable that 0.9 pounds gain is too low for the grass of lot 4 and 207.4 pounds is too high for the grass of lot 5. Combining the feed and gains, respectively, of lots 4 and 5 and of lots 9 and 10, we find that lots 4 and 5 made together 200 pounds gain from grass alone, or 100 pounds for each lot. If, however, we assume that meat meal and tankage are of equal efficiency and that lot 5 correctly represents them when fed to pigs on pasture, and lot 9 when fed in dry yards, we have 43.4 pounds gain produced by each of lots 4 and 5 from the grass alone. Probably, then, the grass produced somewhere between 43.4 and 100 pounds for each of lots 4 and 5. Each pasture yard contained nine-tenths of an acre, so that the pork produced by the grass itself per acre was as follows, after deducting the amount of pork produced by the full feed of concentrates fed the pigs:

Lot
2. Corn meal 2, shorts 1, 278 pounds pork per acre.
3. Corn meal 1, shorts 1, 247 pounds per acre.
4. Corn meal 5, meat meal 1, 48 to 110 pounds estimated, pork per acre.
5. Corn meal 5, tankage 1, 48 to 110 pounds estimated, pork per acre.

In this connection it should be borne in mind that, besides the pork produced, large though the amount is for lots 2 and 3, there was cut off these yards the last of June 1.85 tons of hay per acre. Further than this, as an offset to the expense of fencing pastures, a great deal of labor is saved in caring for pigs if they have the run of grass. No work was done for the lots on pasture beyond providing them with feed and water, and during the last month bedding was taken to them, but the dry yards with their adjoining sheds had to be cleaned at least once a week in order to keep them in decent shape. On pasture the manure was naturally very well scattered over the yards and did not accumulate perceptibly.

"There was a striking difference in the amount of pork made by the grass of the different lots. It is impossible to include corn alone in this comparison, since no pigs were fed corn alone in the dry lot, but of the rations compared above we find that with the one having the least protein—corn two parts to shorts one part—the gain from grass itself is largest; with corn one part to shorts one the gain from grass is smaller, and with meat meal and tankage the rations carrying the most protein, the gain from the grass itself is smallest."

TIMOTHY AND CLOVER PASTURE.

"The gain made by lot 6 on clover was 29.2 per cent larger than that made by lot 1 on timothy pasture. The clover pigs ate 5,562 pounds of corn, which, if it had been fed to lot 1, would have made 100 pounds gain for each 451.4 pounds corn, or a total of 1,232.1 pounds gain. Lot 6 gained 1,336.6 pounds, which is 104.5 pounds from nine-tenths acre, or 116 pounds of pork per acre of clover more than would have been produced by an acre of timothy. Timothy, we have seen, produced 278 pounds of pork per acre with a grain ration of corn two parts, shorts one part, and as it showed itself to be of greater benefit the wider the nutritive ratio of the grain, it is probable that with corn alone the timothy would make more than 278 pounds pork per acre from the grass itself. Thus, from clover pasture from July 24th until the end of the season, we may reasonably expect a production of about 400 pounds pork per acre from the clover itself, when the pigs are fed in addition all the corn they will eat. It is a matter of common knowledge that young, growing pigs can only with difficulty be kept healthy and thrifty on a ration of corn alone in a dry yard, so that practically the value of pasture is even higher than indicated above.

In concluding this review of the work of the Iowa Experiment Station with supplemental feeds, I present the following table, taken from Bulletin 91, showing the profit from different standpoints for the hogs used in the third experiment. Prices of feeds were as follows:

	Price per ton.	Price per cwt.
Corn, 40c, plus 3c for shelling and grinding, 43c per bushel	$15 36	$ .768
Shorts	21 50	1.075
Meat meal, $35.50, plus freight, $1.50	37 00	1.85
Tankage, $34.00, plus freight, $1.50	35 50	1.775

Pasture per acre $4.50 for full season, and since July 24th to November 13th, included, only the latter half of the growing season, it is charged at $2.25 per acre.

PROFITS FROM DIFFERENT STANDPOINTS.

(Third Experiment.)

Lots	Feed.	Cost of 100 lbs. gain in weight	Profit per 100 lbs. gain in weight. Selling price, $6 per cwt.	Total gain in weight by lot. Cwts.	Total profit per lot of 10 pigs	Total corn consumed per lot. Bushels	Profit per bu. of corn fed to pigs	Selling price per bu. of corn fed to pigs. Corn was bought at 40 cents
	Lots 1 to 6 on pasture.							
1	Corn (timothy)	$3 66	$2 34	10.34	$24 20	83.4	$0 29	$0 69
2	Corn 2, shorts 1	3 73	2 27	12.55	28 49	61.2	47	87
3	Corn 1, shorts 1	3 82	2 18	13.32	29 04	47.4	61	1 01
4	Corn 5, meat meal 1	4 03	1 97	12.82	25.26	78.3	32	72
5	Corn 5, tankage 1	3 85	2 15	15.39	33.09	91.4	36	76
6	Corn (Clover)	3 35	2 65	13.37	35.43	99.3	36	76
	Lots 7 to 10 in dry yards.							
7	Corn 2, shorts 1	4 46	1 74	9.09	14.00	55.4	25	65
8	Corn 1, shorts 1	4 40	1 60	10.02	16.03	42.7	38	78
9	Corn 5, meat meal 1	3 88	2 12	12.18	25.82	74.4	35	75
10	Corn 5, tankage 1	4 30	1 70	10.25	17.42	70.4	25	65

From the standpoint of a safe profit, one ration is best of all for the market hog raiser, and that one is corn and clover from the time the pigs are up to 60 pounds weight. At the same time it must be noticed that the supplemental feeds fed with corn on pasture gave greater gains than corn alone on pasture. Where hogs are high priced, therefore, swine raisers can afford to use these supplemental feeds, even on good pasture, for the sake of the extra growth secured; and this will apply with special force to the breeder of pure bred swine, who must have the maximum development which his animals are possible of, if he is to successfully compete in show rings and sales with his fellow breeders.

In every test in dry lot feeding the use of barley and shorts, meat meal, or tankage with corn, has increased the rate of gain, decreased the cost per 100 pounds gain, and increased the total profits when compared with a ration of corn alone. There can be no question, therefore, of the advisability of using some of these supplements with corn, in feeding hogs in the dry lot, when prices for feeds are approximately the same as these tests.

The minimum prices were: For corn meal, 40 cents per 56 pounds; for tankage, $33.00 per ton; for ground barley, 35 cents per 48 pounds; for shorts, $18.00 per ton. The maximum prices were: Corn meal, 43 cents per 56 pounds, meat meal, $37.00 per ton.

In the experiments quoted, meat meal and tankage have both varied considerably in composition, but when of the same composition are apparently of about equal value.

The highest per cent of protein in either tankage of meat meal was 66.36; the lowest 53.54. That which was highest in protein was of somewhat more value than the shipments with lower protein content.

The supplemental feeds used have in no way affected the selling price of the hogs, nor have they, so far as one test of carcasses will show, affected the value of the dressed carcasses.

The high value of good clover pasture is the most striking feature of the entire series of experiments. In the one experiment in which dry lot and pasture feeding has been compared the pasture feeding has given the greatest gains at lowest cost. Clover is credited with 400 pounds gain in pork per acre, from July 24th till November 13th. With pork at 4 cents per pound, this gives a return of $16.00 per acre for clover pasture, and this is for but half the season. I think it is not too much to assume that good clover pasture is worth at least $25.00 per acre per season, when utilized by growing hogs that receive all the corn they will eat while on such pasture.

In closing, I desire to call your attention, briefly, to the work done by the Iowa Experiment Station in demonstrating the transmissibility of tuberculosis from cattle to swine. The losses to the packers from the purchase of swine affected with tuberculosis have become so serious that all buyers buy with a sufficient margin to protect their firms against loss. In other words, all hogs are bought low, in order that the packer may not suffer loss. The result is that the man who ships healthy hogs suffers as much loss as the man who ships tuberculous swine.

In the experiments referred to, four lots of ten head each were used. All tests that could be made to determine the health of the pigs at the start were made, and there is every reason to believe that they were healthy at the beginning of the test. Two of the lots were fed some pasteurized milk and two some milk infected with finely hashed tubercular tissue containing virulent tubercle germs. Within four and a half months from the time they received the first infection the hogs were slaughtered. All lots had received milk, corn and shorts as their main ration. Lot 1, fed on pasture and allowing some pasteurized milk, had two affected animals. Lot 2, fed some infected milk, on pasture, had all animals affected. Lot 4, also fed infected milk, but in the dry lot, had all animals affected. Lot 3, fed pasteurized milk in the dry lot, had no affected animals. The animals most serously affected made less gains than those slightly affected, and these, less than healthy pigs.

Of the hogs that received the infection, 30 per cent only were fit for food, 45 per cent were fit only for lard, and 25 per cent were entirely condemned.

It is difficult to account for the fact that two pigs out of the pasture-fed lot, fed on pasteurized milk, developed tuberculosis, but it is probable that these two were either affected at the start, or were infected by the droppings of cattle. The test shows conclusively, however, that milk containing virulent tubercle germs will produce tuberculosis, even in the generalized form, within four and a half months from time of infection.

It was impossible to detect tuberculosis in any of the lots from a casual examination of the living animals.

All milk that is not positively known to be free from tubercle germs, should be pasteurized before feeding.

ALFALFA AND HOGS.

(W. D. Gose, Spickard, Hogs.)

In accepting the invitation to talk on "Alfalfa and Hogs," I do so without regarding their production as the chief end of life, but simply as one of the means to that end. Your ambition is, or should be, the grand acme of life, and in order to secure this we are willing to devote our time and our thought and our labor to make money. There never was a time in the history of the world when the words "Money answereth all things," found in the book of Ecclesiastes, were more obvious than today. Thus, we labor to make money because it answers so many things and purposes. It is clearly our duty to build up our county, our State, and our nation. A nation's greatest product is man, but men are of no value except as they are virtuous, industrious, and intelligent; and it is to contribute to the education and happiness of this class of people that we are willing to raise horses and cattle and sheep and hogs. I make these prefatory remarks to show to you that through all the years of ceaseless toil and arduous tasks on the farm I have not lost sight of the higher things of life for which we labor.

Professor Miller, while in our county during our institute, wrote me from Trenton asking me a series of questions on hogs and alfalfa. These questions were well chosen and covered about the entire field, and I will discuss them with you at this time. One of the questions is: "About what have you done financially with alfalfa and hogs?" I began raising alfalfa after having read up on what was being done in Kansas in this line. One would infer from Prof. Miller's question that he thought I had made some money. He perhaps got the idea at Trenton. I went to a real estate office in Trenton a few years ago and asked for a loan and mortgaged my farm. A few years later I went back to the same office and stated that I wanted to loan some money. They asked how the change had come about. It came about with alfalfa and hogs, gentlemen. That's how I did it. That's how I reversed matters and had money to loan after having been $2,700 in debt.

I will talk on the last part of my subject first, that will be *hogs*. Prof. Miller asked me, "How do you handle pigs the first two months?" "How do you handle brood sows through the year?" "What length of time do you feed corn before marketing hogs, and about how much?" "How many hogs do you feed from an acre of alfalfa?" Now, I read everything I can get hold of on these subjects and then proceed along the line I think best. The question of how to select the brood sow is one of vital importance if you are going to make money, because in order to raise a hog you must first get a pig, and you must either buy it or raise its mother. I would say, to select a brood sow, go back a few generations, noting facts closely; that is to say, a long line of breeding is necessary to get an ideal brood sow. Fourteen years ago I passed from the Poland-China breed to the Duroc-Jersey. I liked the Poland-Chinas. I had stock from good breeders and I like Poland-Chinas fine. I have nothing against them. Fourteen years ago I went out of the one breed into the other with the view of increasing the number of hogs per brood sow. That was the only thing I had in view. I sent to a breeder in 1893 and bought two gilts that farrowed in March, and I have never bought another brood sow away from home. I proceeded this way: I would take a sow that was a good mother, fairly well made, and that brought a large litter of pigs, and from her progeny select the best of her sow pigs, and so on down through a series of years until I reached such a point of prolificness in my brood sows that I did not have to pay any more attention to that. I would take any brood sow that would, in my judgment, make a good fattening hog and bring a large litter of pigs. That was my idea. To get a hog that would fatten easily and breed a large litter of pigs. I want to say here that in going out of Poland-Chinas into Duroc-Jerseys I covered a period of seven years; and I learned the following to be a fact, although you may contradict it. I have said already that I like the Poland-China hog. I say this now, that in passing from one breed to another, holding to the Poland-Chinas until I could get a sufficient number of Durocs, I learned that 15 Duroc-Jersey sows will just about equal in prolificness 20 Poland-Chinas. I am building up one herd with another, and my object is to get hogs at the lowest possible expense, and the difference in keeping 20 brood sows and 15 is the difference in the two breeds.

Now, as to how I selected brood sows this year. It is pretty hard to get alfalfa hogs not too fat. Alfalfa gives them bone and muscle. I have about 100 head of spring pigs. They are allowed to run in the alfalfa with about ¾ of a pound of corn per day. Now, they were fed that way until the new corn crop came in, and all ran together until this period. Then they were in such good order that I could easily determine by looking over the herd the sows that were going to take on fat most easily, and that is the end of hog raising. Get her fat and put her on the market. All I did in selecting what I wanted was to go among my hogs and pick out those that I thought were going to fatten the best. Some will say you will soon get your hogs so they will become chunky. I recognize that. I govern this solely by the sire. I think it very important, if you have plenty of alfalfa, that you have at least 100 hogs and spring pigs to turn on it.

Now, I come to the next question, how shall we handle hogs until weaning time? All of you who don't raise alfalfa feed shorts and bran, don't you? Well, that's all right. I used to do it, but I don't now. Until they are three weeks old they get alfalfa through the mother, and at that age they can begin to eat it themselves. They grow rapidly and then I teach them as best I can to eat corn. I shell the corn. A pig will eat shelled corn about as early as anything else you can give it. It will eat shelled corn quicker than slop. I want to say right here that I have never seen the time when I was afraid of my hogs eating too much corn when they had access to alfalfa. You know you are afraid pigs will eat too much corn and get chunky; but they don't do this when you feed them alfalfa too. You need not be afraid as long as you let them run on alfalfa. When the mothers are fed alfalfa, their milk will balance all the corn the pigs eat up until the time they are weaned. Allow the sows to wean the pigs themselves. They will do this and soon be prepared to produce the next litter. I feed the sows some corn until they wean their pigs, and then do not give them any more. This year corn was scarce and I did not feed the pigs any at all. They were turned on alfalfa and did not get any corn. I fed the sows some more corn and they grew fat and some of them went on to the market. I gave them ¾ of a pound of grain per day and they grew fine.

Now, as to the question how long I feed corn before marketing and how much. I feed these sows all summer ¾ of a pound per day. As soon as the new crop comes in I increase their feed gradually until they are pretty well on full feed, and then after about two weeks of full feeding I sell them.

As to keeping the sows the other six months, I give my brood sows all the alfalfa they will eat, and it would surprise you, too, to see how much they will eat. I shell about 20 ears of corn and sow it over the feed lot, and in that way no one hog gets more than its share of grain. When you are feeding such a small amount, you must do that in order to get it evenly distributed. It is not much but it will do some good. You will please note this fact: Corn does not furnish the proper nourishment for an animal that is expected to bring a large litter of healthy pigs. The brood sow needs a bone and muscle making food, and she gets it in alfalfa, also in red clover and alsike.

Now the question of preparing the ground for alfalfa. In the first place will say it has been my custom to sow in the spring. While on the train coming down here some gentlemen were talking with me about alfalfa and said they were thinking of putting out a crop and asked me the best way to get a crop of alfalfa. I told them I sowed mine in the spring, but it necessitates the mowing of each crop five times to keep back the weeds—a pretty hard task when you come to think of it. These men did not want to lose the use of their land for a year; and I told them if they had rich land they could prepare it well in the spring and sow it to millet early in April. Millet will mature within about ninety days, and when that crop is taken off the ground will be in good condition with disking for a crop of alfalfa; and in this way the use of the land is not lost for a year. If you can get the moisture you are almost sure to get a crop next year. Of course you take chances on winter freezing; but I really believe that by sowing the last of August or the first of September, if you have sufficient moisture, you are pretty sure to get a crop next year.

There are some things which have kept farmers from sowing alfalfa which were not intended to do so. For instance, one of our agricultural papers made this statement a year or two ago: "It is useless to sow alfalfa on ground where posts are heaving out." Now, of course, many a farmer seeing that statement would believe it. Sometimes we think alfalfa is killed off when it really is not. You have heard the statement that if you have taken off the crown of your alfalfa you have killed it. I have found that is not true. That happened to my crop at one time and I supposed it was gone; but was surprised later to see little white sprouts starting up on the stalks all over the field. So you cannot believe all you hear. Another statement I have recently heard made is, that red clover is a weed in alfalfa. I know that is not true. Red clover is no detriment to alfalfa whatever. In fact it only lives a little while. It dies out in two years, while alfalfa is of perennial growth. Red clover would not stand three consecutive cuttings either, while the longer you cut alfalfa the better it seems to get. If you cannot grow alfalfa, then grow red clover or blue grass. I want to say this, that red clover is not only not a weed, but red clover, alfalfa and alsike make a perfect paradise for hogs. There is no doubt about that. I have it on my own farm and it is splendid. I sowed five acres of alfalfa last year for my brood sows and small pigs and secured a partial stand. I am going to disk the ground lightly in the spring and sow alsike and red clover with it. I will make it as thick as I can and I will have an ideal hog pasture. I could not get a better one.

Now as to ground. I began growing alfalfa in an experimental way on second bottom land. Then I increased on the same kind of land until I had five acres sown there. Then I thought the question of growing alfalfa on our place was settled, and I named our farm "Alfalfa Glen," and then made my first mistake next spring by sowing 18 acres. That was too much. I had to mow it five times and I lost half of it. Alfalfa won't succeed on land where water will stand within three feet of the surface all the time. Water may run over alfalfa and stand on it as long as three days, but where the water stands on the ground all the time alfalfa will not grow. If you have upland you will just have to try alfalfa and see if it will grow. I was told that it would not, but it did for me, the difference in the crop being about the difference there would be in a crop of corn on rich lowland and on upland soil. Common sense would tell you you could not get as good a crop from the one as from the other.

But I must hasten on. The question, "what I have done financially," includes hogs and cattle and sheep. I keep a book at home in which I enter a record of the sales I make. I went over this book just before coming down here, and found that from the 13th day of October, 1904, to the 16th day of November, 1907 (three years) I had sold $3,189.99 worth of hogs—an average of $1,065.39 per year.

Before I close my talk, I want to tell you how glad I am to be here. I have read so much about your meetings. All of our boys who have been down here have come back feeling better, and they are talking about the short course now, and one thing they are saying is "*Our* Experiment Station," "*Our* University," etc. It used to be "*The* University," and "Down there at *the* Experiment Station." I tell you *Old Missouri's* Experiment Station is coming to the front. It used to be you would hear more about what other states were doing than about what we were doing. But now old Missouri is coming to the front and the grand old State is educating us all along the line.

And in the 60's when we went out to fight, the country furnished 77 per cent of the men who fought. So we are at the back of things, and over and under them, and we should seek to make the very best country possible, and all the obstacles in the way of the farmer should be removed.

In conclusion, I say again I love the farmer.

ALFALFA IN SOUTHWEST MISSOURI.

(Simon Baumgartner, Pierce City.)

Until about eight years ago this summer alfalfa growing seemed almost impossible, but perseverance has won, and after a great many trials, or rather failures, I have solved a perplexing problem. My nine-acre field in five cuttings produced about 6½ tons of hay per acre the season of 1906. In 1907 the crop fell short on account of the hard freeze in April. It made about 4½ tons per acre. I top-dress my field with good stable manure, about 4 to 5 tons per acre during each winter. In the spring I harrow both ways to pulverize and level the surface. About the middle of May the first crop is ready for harvest. I mow one day and usually put it in the barn the next. Alfalfa can be mowed away pretty green. It will heat of course, but there is no harm in that. It must be spread evenly as it goes in the barn, and I use about two gallons of salt to the load. Sprinkle salt evenly as the hay is spread, then shut the doors to keep the cold night air out. The result is a very nice green hay, of fine aroma, and free from dust. This is the kind of hay that makes the horses laugh and the cows give milk. As soon as the field is cleaned off I hitch on to the disk or spring tooth harrow, whichever I think best to use, and work up the ground in good shape. Cultivation is absolutely necessary in this section, and in my opinion would be beneficial most anywhere, for it is the only way to keep the field clean. The disk and the spring tooth harrow will keep undesirable plants in check, and there is practically no harm done to the alfalfa plants. In fact, they will do better, grow more vigorously, besides the advantages of a loose cultivated surface are numerous and well understood. Ninety-eight per cent of my hay is fed out on the farm, very little sold. This enables me to practically cover my land each year with the very best manure, hauled direct from the stable to the field and spread without loss of any kind and no extra handling. This means better crops, and my land improves every day I farm it. Results speak for themselves. Twelve years ago, when I bought this place, it was referred to as an old worn-out farm, for it has been in cultivation as long as any land in this section, and in fact would not produce more than ten bushels of wheat per acre, and other crops in proportion. I had ten acres in clover, which was sown on growing wheat in March, 1905. I manured it heavily during this winter; sow it to cowpeas next May. Harvest them in August and disk and harrow the ground until I have it in the very best possible condition to sow alfalfa. I repeat what I have so often said, "there is no better way to prepare land for alfalfa than by sowing it to cowpeas;" but the growing of one crop of cowpeas does not insure success with alfalfa—that depends on the condition of the land. As most of our soils are sour or acid to a remarkable degree, lime must be applied in sufficient quantities to correct that abnormal and unfavorable condition. I hope to live long enough to see some alfalfa growing on every farm in this section. It can be done, and by doing so, you don't make "two," but four or six blades of grass grow where only one grew before. So you had better be at it and do something. I was born and raised in a county where alfalfa grows well, learned its feeding value, and its even greater value as a soil builder. In my boyhood days and during the twenty-four years which I have lived here I have spent more time, money and work on this than any other one proposition. I have corresponded with the best authorities of both this country and Europe on the subject, and after so long a time have finally succeeded.

ALFALFA.

(Geo. W. Williams, Humansville, Mo.)

In giving a short paper on Alfalfa, the most wonderful forage plant of all plants, I shall give my own experience and observation here in south and southwest Missouri, for there is not a rule or plan in regard to its culture that will hold good everywhere.

I find many failures here can be attributed to the grower trying to follow the advice of some one whose environment is entirely different from what it is here. Alfalfa, like many other plants, will adapt itself to its surroundings after a few years growing under certain conditions.

There are many mistaken ideas prevailing among farmers that have caused many failures and many more not to try to grow it. If there had been one-third less written and said about how to grow it, there would be three times as many growing it in Missouri as are growing it today. Some man in western Kansas or Nebraska tells all about the kind of soil it grows on and when and how to sow it for a success. The Missouri farmer knows his soil is different and will not try it, or he does not know that it is different and does try it, and a failure is the result. It would have been much better if that Kansas or Nebraska man had put in his time telling its feeding value, and not in getting our Missouri farmers enthused over it as a feed. Then they would at once set about trying to find out how to grow it, not in Kansas or Nebraska, where it is grown under irrigation, but here in Missouri, where we depend on the rainfall and usually have a little too much for best results. I have been growing it for fourteen (14) years, and the best crop I have ever raised or ever expect to get again unless we have another season like it, it was the dry year of 1901. That year I fully disproved the idea that alfalfa sent its roots deep in the earth searching for water. I found in the fall of 1901 and the following spring, that the roots of plants from seed sown in the fall of 1900 and passed through the extreme dry season, when all surface moisture had evaporated, were no deeper in the ground than plants of the same age from seed sown any other season. And if the plant roots are going down after water why will they go deeper in an extreme wet season than an extreme dry one? The fact is, the roots are searching for plant food and not water. In three tests I have made, by supplying plenty of potash, wood ashes on the surface so the plants had access to it, after three or four years the roots were but little deeper than the roots of many other plants.

I have some that has been growing for eight years on upland gravelly land, where there is a solid limestone rock within from three and one-half to five feet of the surface, and this part of the field is in good condition yet.

I shall only touch the manner of seeding. I have had the best results to sow it after cowpeas, cut the cowpeas off, do not turn the ground but disk or work up a nice seed bed with a spring tooth harrow, and sow any time from the 15th of August to the 15th of September, when there is sufficient moisture to germinate the seed and keep them growing. If sown broad cast sow twenty pounds of seed to the acre, but with a press drill sixteen pounds will be plenty. Sow enough to get a good stand at first, for if it comes up too thin it is a big job to try to thicken it afterwards. Do not sow any nurse crop; it will take care of itself. It does well after wheat.

If sown after wheat the ground should be turned as soon as possible after the wheat is cut, but not turned deep, two and one-half or three inches being plenty. When the weeds and grass start, go over it with some kind of "weed killer," and do this as often as they make their appearance, and by sowing time there will be a nice seed bed. I have had very fair success sowing after corn. Get the corn off out of the way, feeding while green to hogs and dragging the ground until level, then harrow until the seed bed is good. The seed should be covered about the same as millet or any other seed of that size. Do not sow it on fresh plowed ground. If sown on a very sour soil the seed will germinate all right and the plants grow from 3 to 5 inches high, turn yellow and disappear. After the plants are 6 or 8 inches high, examine the roots and see if there are any nodules, and if not better inoculate with Alfalfa Bacteria. This is easiest done by going to a field where alfalfa has grown for several years, and getting a few hundred pounds of soil and scattering it over the field. Do not pasture it until two years old and never when the ground is soft.

Now let us discuss briefly the care it should have after once a stand is procured. I have received many letters telling me that the writer's alfalfa did well for a few years, but the foxtail, crabgrass, blue grass, white clover, and in some instances, Japan clover, had crowded or smothered it out, and asking what to do to get it cleaned again. Perhaps I cannot answer those questions better than to give my own experience along that line. I had about three acres that got in just the shape these writers tell me theirs did, i. e., foxtail, crabgrass, blue grass, white clover and Japan clover were crowding it to where it was dying out. I saw something must be done or I would lose the piece. I tried the disk, cutting it both ways, but when I would set the disk at an angle that would destroy grasses it would injure the crown of many of the alfalfa plants, and was not a success. I next tried a heavy spike tooth harrow, that I had made to order for a new piece of stump land, and this was no better, in fact, the Japan clover thrived under the treatment. I have a spring tooth attachment to my cultivator, five little plows on a side—ten in all. I tried this and in very few moments I found I had struck the key note. I bought a spring tooth harrow at once and went after the Japan clover. After going over it each way I had torn up so much that I was compelled to rake it up in wind rows with the hay rake and haul it off before I could do any more. After another going over I had it cleaned and no injury to the alfalfa was noticeable, as springs are flexible and will either hang and jump over the plant or slide around and cut all the grass right up against the roots. I might mention that there was a corner of that piece that was set with wild onions, and they were so strong in the hay that the horses did not like to eat it, but the spring tooth harrow made short work of them. After every cutting I go over my entire alfalfa field with the spring tooth harrow and do not have any more trouble with any foreign growth, and it cultivates the plant and makes it grow much thrifter. The spring tooth harrow is the tool to use on the alfalfa, in fact, it is a good implement to have on the farm for many purposes. Since getting mine I seldom use the steel smoothing harrow any more.

DISCUSSION.

Q. How many hogs do you feed to the acre of alfalfa?

Mr. Gose—You can take a patch of alfalfa, say 14 acres, and 14 brood sows, one sow and her litter to one acre of alfalfa, let them run through the year on the alfalfa, and it will hardly make any impression on the crop. You will find they have trampled it down in a few places and beat a few paths through it, but you will go right on and get your crop off of it, and put your hogs on the market with very little corn; and I maintain that you have made the cheapest pork that can be made in the United States and in the world, and you have got your hay besides.

Q. Describe the kind of soil you grow alfalfa on as regards soil content.

Mr. Gose—Well, I have no sour land on my farm. You would counteract that with lime. I have never inoculated any soil until last spring. I hauled out 15 bushels of dirt from the low land to the high land and inoculated it. The kind of soil I have sown on consists pretty nearly of every kind of soil in our county. On my farm I am growing alfalfa on what you would call hardpan.

Mr. Crabtree—What kind of stone do you find on the higher land that surrounds your farm—limestone, sandstone, or what?

Mr. Gose—I do not find any kind. If you will come and show us where to find some you will be right in it. We have prairie land and timber land, but no stone at all.

Q. Do you wait until the alfalfa blooms to clip it back?

Mr. Gose—No, you will lose everything if you do that. The first crop may never bloom. If I had time I would never let alfalfa bloom at all. That may sound strange to some of you old alfalfa men. I would have five crops instead of four if I never let it bloom. My fourth crop was cut in October. It was about 12 inches high, and it is as green now as it would be standing out in the pasture. I have sixty pigs that came in September. I will tell you how I am feeding them. Those sixty pigs eat all of that alfalfa they want. Then I give them sixty ears of corn in the morning and sixty ears in the evening. In addition to that, in the morning I give them a little slop made of two parts of shorts and one part bran. I give them this slop instead of water. I make it about as thick as buttermilk, and give them three large bucketsful of it. In order to make the slop go round, and to keep the big ones from getting it all, I pour in one bucketful of slop and then shell a half bushel of corn and scatter some on the slop; then put in some more slop, then some more corn, etc. I got 50 of those pigs on the scales 30 days ago and they weighed 2,020 pounds; and I weighed them again just before coming up here, and they weighed 2,700 pounds. Now that is not much, but you know that some pigs in the winter stop on us entirely. If that increase can be kept up through the winter we will be doing well.

FURTHER DISCUSSION.

(Led by T. P. Russell, Pemiscot County.

Q. What do you consider to be a stand?

Mr. Russell—I sow 20 pounds of seed, and of course a great deal of it dies out. We cut two tons the first cutting. We have five different cuttings, and average one ton to the cutting.

Q. What is the most successful time of seeding in your locality?

Mr. Russell—We seed in the spring. We have sown in the fall, but the fall sowing is more apt to die out.

Q. Do you sow a nurse crop?

Mr. Russell—No, never.

Q. What kind of land have you?

Mr. Russell—Most of our Pemiscot county land is dark, with a sandy sub-soil. It is Mississippi bottom land.

Q. Is alfalfa a successful crop on the prairie?

Mr. Russell—Yes.

Q. Do you raise alfalfa on gumbo land?

Mr. Russell—Yes, we find it will succeed on gumbo.

Q. Do you tile drain your soil?

Mr. Russell—No, we have a sub-soil of sand which acts as tile drainage.

Q. Where do you get your seed?

Mr. Russell—We buy it from the St. Louis Seed Company—it is western seed.

Q. Is the matter of curing a serious problem in your locality?

Mr. Russell—We have quite a good deal of trouble on account of excessive rains; but this year we had no trouble at all in curing our crop.

Q. Compared with clover how is alfalfa to cure?

Mr. Russell—Alfalfa is more easily cured than clover.

Q. Have you had any trouble with water grass choking out the alfalfa?

Mr. Russell—Yes, a great deal.

Q. Have you ever tried disking to keep out crab grass?

Mr. Russell—No, but we are going to try it this spring.

Q. Is there any definite height to which you let the young alfalfa get before you begin to clip it?

Mr. Russell—No, but we practice this rule; we allow the young shoots to appear for the next crop at the roots of the stalk before we ever clip either the old or the young. I notice Mr. Gose said awhile ago that he would not allow the alfalfa to bloom at all if he could find time to get around to it, but we let our crop get pretty well in bloom.

Q. Are you speaking of the first crop?

Mr. Russell—The first crop will not bloom very much. We don't wait for it. We depend on the appearance of the new shoots at the root of the plant. If cut too soon we have found it seems to turn yellow. And it sometimes dies if clipped too often. It is recommended in some localities to clip often, but it won't work in my section.

Q. When do you begin cutting?

Mr. Russell—We occasionally begin cutting in about nine weeks. That can only be done on the bottoms. We have got as much as three crops the first year. We sow in April, and in nine or ten weeks begin cutting hay. Sometimes we make five crops in a year. We cut the hay early in the morning as soon as the dew will permit. Then we run the mower the rest of the day. We sometimes leave the hay on the ground until the following day, and then put it in the barn. We never stack anything up. We have come to the conclusion that barn space is cheaper than to stack the hay out.

Mr. Crabtree—Right along that line of curing; I take it that you cut early in the morning so that the hay will have the benefit of the sun during the entire day; that's the point, is it not? I have a new idea along this line, and I would like an expression from the farmers who have been thinking and putting their thoughts into effect. It is the nature of the leafage of plants to breathe out the moisture that has been taken up through the roots in the night. If we would mow a crop of any kind late in the evening so that it would not become sun dried, the leaves will go on and perform their function of breathing out the moisture. When cut just before sun down, the plant being green will absorb no more of the moisture of the air and the leaves will perform their duty, and the hay will be cured better.

Mr. Russell—I have noticed no difference. We cut all day. We have a good many acres of ground, and by the time we go over it five times each season we are kept pretty busy. I have noticed no difference in drying in that cut early and that cut late in the day. If anything, we think the hay cut early in the morning dries out more perfectly than that cut in the evening.

Q. What about this matter of kiln-drying alfalfa?

Mr. ....—That is a little premature yet. We conceived the idea at the World's Fair. Experiments were made with hay, subjecting it to the heat of an oven, and it retained its green color. I asked Dr. Waters what he thought of it, and he said he thought it would be hard to compete with old Sol when it comes to making hay. But we are not discouraged, and have done some experimenting with the ordinary lumber kiln. The U. S. Department of Agriculture has sent their Mr. McClure to our place, and he has worked with us in curing alfalfa, and we have found some very encouraging results brought out in the feeding quality of this kiln-dried hay. The idea is to cut the hay, no matter what the conditions of the weather, just so it is not pouring down rain, take it up with a rake, put it on a wagon, put it right through the kiln and in an hour's time it will be dried. We dried some hay in fifty minutes and it has kept; but I don't know whether we can make it practical or not. There are many points in its favor. When we want to cut it we won't have to wait to see how the moon is, or the condition of the weather. As long as it is not raining we will be cutting it. This will enable us to get the whole plant. The best part of the alfalfa is in the leaf, and if it is too dry when you take it up a big per cent of the leaf will be left. Another thing, we will have regular even growth on all of our hay, which ought to demand a better price. The analysis from the government shows a gain of 25 per cent over the barn and field cured hay.

Q. Do you bale that hay?

Mr. Russell—Yes, bale it if you can, because that is one of the biggest savings in the process. It saves storage and gets on the market 30 days sooner.

Q. What is the comparative value of a crop of alfalfa and a crop of corn on your land?

Mr. Russell—Well, I'm not sure. Alfalfa is worth six or eight times as much as corn.

The table given below shows the chemical analyses or the feeding value of alfalfa hay when cured by the common method in the field, and of artifically cured hay.

The samples were secured and prepared by Mr. A. S. Russell of Hayti, Mo., in co-operation with H. B. McClure of the U. S. Department of Agriculture. Chemical analyses made by the Bureau of Chemistry of the U. S. Department of Agriculture:

	Ether extract. (Fat.)	Ash.	Crude fiber.	Albuminoids (N. X. 6.25). (Protein.)	Nitrogen free extract. (Starch, etc.)	Moisture.
Green	3.03	9.78	27.33	19.39	40.80	72.31
Green	2.75	9.41	27.80	18.94	41.04	74.93
Barn	2.05	7.03	28.07	14.21	48.76	16.72
Barn	2.19	6.71	28.22	13.22	49.76	17.19
Artificial	2.77	9.50	30.85	17.65	39.17	3.92
Artificial	3.80	8.75	23.93	19.73	43.75	5.94
Artificial (bale)	2.16	6.75	37.01	12.40	41.67	11.72

The green samples were taken as soon as cut and did not lose any of its moisture content.

The barn samples were cut and cured in the field in the ordinary way and were taken from the barn after being there about one month.

The samples of artificially cured hay were taken as soon as cut and cured in forty minutes. The first two were analyzed a few days after curing, and the last sample was baled immediately after curing and left in the bale for eight weeks.

It is interesting to note that the samples of artificially cured hay contain on the average a larger per cent of nutritive elements than the samples of the field cured hay. This is very noticeable in the protein content of the samples.

The average protein content of the two first samples of artificially cured hay is 18.68 per cent, while the average of the samples taken from the barn is 13.71 per cent. This gives a difference of 4.98 per cent, or, the artificially cured hay contains 27.5 per cent more protein than the barn hay. When considering its protein content the artificially cured hay is worth one-fourth more than the other; that is, one ton of artificially cured hay is equal to one and one-fourth tons of hay cured in the field by the common methods.

The amount of ash in the artificially cured hay is a little higher than the field cured hay.

In crude fiber the barn hay is lower. In the nitrogen free extract the barn cured hay is from 5 to 9 per cent higher than in the artificially cured.

In summing up the results of the analyses, it shows that so far as the actual amount of nutritive elements is concerned, the artificially cured hay is much more valuable than the hay cured in the field.

The ether extract in the artificially cured hay is, on an average, higher than in the field cured hay.

Mr. Gentry—There has been very little alfalfa raised in Pettis county. I raised some two years ago which was quite a success. I tried sowing some this fall, but it has not done very well. I doubt whether it will go through the winter; but I expect to sow more in the spring. I believe we can grow alfalfa if we go at it intelligently. I believe alfalfa is a good feed for hogs, but I don't believe quite as much in the hay proposition as the speaker who addressed us a while ago. I think hay is pretty good for the hog, but corn is good, too. I never saw a hog that did not like corn. I think that good corn is one of the best things we can give a brood sow, and in fact we have had better success in giving brood sows corn than in giving them too much mushy food. If a man will select his ration right, he will find corn is good for a hog at any age, and for brood sows especially. Teach your pigs to eat corn. I don't beliee in a watery diet for little pigs. I like a solid diet. The saliva is more thoroughly mixed with the food and we get a better digestion. Start them on solid food. Don't be afraid to give them corn; the mother's milk will balance the corn. Especially in the spring of the year if you undertake to feed slop to small pigs you induce scours and other diseases. I am a firm believer in corn. Mix alfalfa with your corn, but don't fall out with corn.

Mr. Crowell of Bates county—I want to ask Mr. Gentry when he sows alfalfa in Pettis county.

Mr. Gentry—The first year I sowed it on the 20th of September, which was a little late, and lost about one acre out of the three we sowed. The rest of it did finely. This fall we were late in preparing the ground and the dry weather came on and we did not sow it until the first of October, and I am afraid it will have a hard time to live until spring.

Q. How much do you sow per acre?

Mr. Gentry—Twenty pounds to the acre.

Q. I have been told that 10 pounds is just as good as 20.

Mr. Gentry—It depends on the condition of the soil. We would rather sow two or three times as much as is necessary in order to get a stand; but if you put your land in proper condition and sow at the proper time I have been told by men in Kansas that 10 pounds is more than you need. It is best to start growing it in a small way.

Q. Do you sow the seed with a drill or sow it broadcast?

Mr. Gentry—I sow it broadcast.

Mr. Crowell—I put in 30 acres of alfalfa on the 16th of September. I believe that in the low lands of the State, where you undertake to prepare the land for alfalfa, you have less trouble in the spring than when you sow in the fall. I sowed my alfalfa at the same rate Mr. Gentry sows his—20 pounds to the acre. I doubt if you can be successful with a smaller amount the first time you put alfalfa on your land. I would not advise anyone, in making the first stand, to sow less than 20 pounds to the acre. I sowed mine in the fall and it was the handsomest field I have ever seen in my life. It ran from the high ground down to a branch, and was absolutely level, with the exception of one hill in the northeast corner. The hedge was trimmed evenly, and every one who passed said it was the handsomest field that he had ever seen. I had some difficulty next spring in saving the first crop. I had the whole 30 acres cut, and then it began to rain and rained for a solid week, and that alfalfa lay on the ground. The next Monday I got it up and put it in a rick and put three barrels of salt in the rick, and the cattle ate it all winter. The next two crops I saved; the first averaged one ton to the acre, the second one ton and the third 60 per cent of a ton. I had a great deal of trouble with foxtail and crabgrass. Some parts of that field got too near the water level and I guess got "cold feet" and died.

Prof. Miller—On most thin lands manuring is essential to raise a crop of alfalfa. Mr. Baumgartner of Pierce City top dresses his land with manure every winter, and he claims that that is very essential in order to get a stand.

Q. How can we raise alfalfa on our black prairie land, underlaid with hardpan?

Prof. Miller—Our experiments to date on that kind of land, especially that underlain with heavy clay, show that it takes a great deal of care to learn how to raise alfalfa on that kind of land. The land must be heavily manured, and should be just as well surface drained as you can get it. If you can under-drain it, all the better. I will admit that under-drainage on some flat lands is a difficult proposition. We have been conducting some experiments on that kind of land. Some of the results are very encouraging, even in the northeastern and southwestern parts of the State. So you will find that on all of this land you must learn how to handle the soil before you can make a success of alfalfa. We don't say that the soil of this State is all adapted to the growing of alfalfa, but I think that when we learn how to grow it, when we learn how to treat the different kinds of soil, that we will be able to grow alfalfa as widely as it is now grown in Nebraska and Kansas.

Q. Is it not a dangerous process to put alfalfa on tile-drained land?

Prof. Miller—No, I think not. Wing Bros., the big alfalfa growers, have all their alfalfa land under-drained, and I have heard of no trouble.

Mr. ....—I think in the case of the gentleman from Pettis county, he ought to under-drain his soil. It is better than manuring. Under-draining is the main point in any soil of that kind.

Prof. Miller—Yes, that is true; and we should always begin in a small way to grow alfalfa. If you sow 50 acres you are almost sure to fail. It is better to start with 2 acres rather than 50.

IMMUNIZATION OF SWINE AGAINST HOG CHOLERA.

J. W. Connaway, Veterinarian, College of Agriculture and Experiment Station
University of Missouri.

Gentlemen of the Live Stock Breeders' Association:

The economic relation of "hog cholera" to the swine industry is so important that the discussion of this subject is always in order at a meeting of this kind; and I am glad to be able to give you some hope that the losses from this plague will in the near future be greatly diminished by means of "preventive inoculation."

With the possible exception of tuberculosis, the "infectious diseases of swine" have engaged the attention of the farming public and of veterinary scientists to a greater extent than any other disease affecting farm animals.

Nearly thirty years ago, and before the organization of the United States Bureau of Animal Industry, the Commissioner of Agriculture caused important investigations to be made into the nature of these diseases. Dr. D. E. Salmon, who was later appointed Chief of the Bureau of Animal Industry, Dr. James Law of Cornell University, and Dr. H. J. Detmers were appointed to carry on investigations, independently, in different parts of the country. The reports of their investigations left but little to be added in the way of description of the gross objective features of the disease or diseases, which we now know as "hog-cholera" and "swine plague." Each of the above named investigators conducted bacteriological researches, but the results of these furnished no conclusive evidence as to the true cause of the disease, or a safe basis for "inoculation" or "vaccination" methods.

Since the organization of the Bureau of Animal Industry, work along this line has been prosecuted with vigor, first under the administration of Dr. Salmon, by Drs. Theobald Smith, V. A. Moore, Kilbourne, De Schweinitz, Schroeder, Dorset and Niles; and more recently under the present Chief, Dr. Melvin, by Drs. Dorset, Bolton, Niles and McBryde.

Investigations have also been carried on at a number of State Experiment Stations, of which I may mention South Carolina, under Drs. Bolton and Niles; Nebraska, under Dr. Billings, and later by Dr. Peters; Indiana, by Drs. Craig and Bitting; Arkansas, by Dr. Dinwiddie, and at our own Station here in Missouri.

A brief review of a part of this work is pertinent, and I trust will be instructive. Much of the painstaking work that has been done has not, from a practical point of view, been rewarded with fruitful results; and some of it, which for a time gave promise of supplying an effective method of preventing hog cholera, proved a disappointment when put to a severe practical test. Such researches, however, are not without value; they are often necessary steps in discovering the true road to success.

In the earlier investigations of the Bureau of Animal Industry a bacillus was discovered in the blood and organs of hogs affected with cholera, that was regarded by Salmon and Smith as the specific cause of the disease. This bacillus was a short rod-like organism with rounded ends and provided with delicate hair-like processes, the rapid vibrations of which cause the bacillus to move about actively in the culture fluid in which it grows. Later several investigators in this and other countries found the same bacillus so constantly associated with hog cholera that it was generally accepted as being the true cause of the disease. As to its disease producing powers, it was found that a very small quantity of an artificial culture of the germs, injected under the skin of rabbits, would cause death within a week or ten days; and when injected into the veins death resulted within 48 hours. It was also found to be fatal to guinea pigs, mice and pigeons. Swine die very promptly when inoculated intravenously with fifteen to thirty drops of a fresh growth of the germs; but as a rule, they do not die when injected simply under the skin. "Cultures freshly obtained from diseased animals are more virulent than those which have been grown for a considerable time in artificial media." This bacillus was found in hogs presenting the common type of the disease, viz.: Congestion and ulceration of the bowels, congestion of lymph glands, enlarged spleen, haemorrhagic spots on kidneys, etc.

Later in the investigations of the Bureau an outbreak of hog cholera was encountered in which the prominent feature was an inflammation of the lungs (a broncho-pneumonia), along with some of the disease changes seen in the usual type of cholera. In the tissues of the affected animals that were examined, the hog cholera bacillus as described above was not found, but a short, oval bacterium was discovered which does not have the delicate hair-like appendages with which the hog cholera bacillus is provided, and does not have the power of moving about in the fluids in which it grows, and when staining fluids are applied to it, the ends or poles of the bacterium become well stained, while the central portion remains unstained. This discovery led to the conclusion that we have in this country two highly infectious diseases of swine instead of one. To the disease which appeared to be caused by the newly

Inoculating a pig against Hog Cholera, Veterinary Department, Missouri Experiment Station, 1907-8.

discovered bacterium the name "Swine Plague" was applied. It was found, however, that cultures of this microorganism from different sources were quite variable in their action when inoculated into experiment animals. In some cases a rapidly fatal septicaemia, "blood poisoning," was produced in rabbits; while in other cases no serious illness resulted; and especially were the effects on *swine* doubtful when cultures of the germs were injected subcutaneously, and the feeding of cultures, or even of the viscera of inoculated rabbits proved negative.

"Injection of the germs directly into the circulation is usually fatal when virulent varieties are employed." "When the bacteria are injected directly into the lung tissue through the chest wall death may follow in 16 to 24 hours, or life may be prolonged and a severe inflammation of the lungs may result."

Following these investigations, efforts were directed towards discovering effective means of immunizing swine against the diseases mentioned:—

Experiments were made to determine whether the bacteria described could in any way be utilized as a vaccine against these maladies. Success in this direction had been attained in other diseases; for instance, in "anthrax" and in "black-leg." Domesticated rabbits, having shown a susceptibility to the pathogenic action of the swine bacteria mentioned, these animals were used mainly in the laboratory experiments, and it was found possible to produce a considerable degree of resistance in these animals against the "hog-cholera" and "swine-plague" bacteria, that had been cultivated artificially, and the same was also true in the case of swine; but when the hogs, which had been immunized against the bacteria grown artificially in the laboratory, were exposed to natural outbreaks of cholera they showed no great resistance to the disease; and for practical ends these measures failed.

The "toxins" or poisonous products produced by the bacteria during their growth were next tried as immunizing agents. Dr. Von Schweinitz separated from artificial cultures of the hog-cholera bacillus, and the swine-plague bacterium, certain chemical substances (alkaloids and albuminoid products) some of which he found to be poisonous, and with which he produced with graduated doses a certain degree of resistance against the usually fatal doses, that is, in small experimental animals—guinea pigs. Both he and the Chief of the Bureau felt greatly encouraged, and were led to think that in the use of these chemical substances a practical method of preventing these diseases would be found. The chemist mentioned even produced a substance by purely chemical methods, without the intervention of the bacteria which seemed to have the same action as the substances isolated from the bacterial cultures. Later events, however, demonstrated that none of these substances could be depended upon to produce immunity in *swine* against the *natural* disease.

Following this, the investigations were directed toward the production of an "immunizing or antitoxic serum" by the inoculation of horses and cattle with gradually increasing doses of the cultures of hog cholera and swine plague bacteria, somewhat in the manner of the production of the "antitoxin," which is used so successfully in human practice against diptheria. Extensive experiments were made by Drs. De Schweinitz, Dorset and Niles of the Bureau of Animal Industry and by Dr. Peters of the Nebraska Experiment Station. The reports that were issued in regard to the experimental work and practical tests indicated for a time that a practical solution of the problem had been attained. But, unfortunately this method in the end failed to meet the requirements.*

The reason for the lack of success in the above mentioned experiments is now very plain; and is this: *The Prime Cause of the disease had not been discovered;* and the several investigators had been working with bacteria which play only a secondary role in producing the phenomena observed in hog cholera (and probably swine plague).*

The unsatisfactory results in attempting to produce immunity by means of the bacteria mentioned, as well as other facts, in regard to these bacteria, which were observed in the various investigations, led to some doubt as to the so-called hog cholera germ being the true cause of the disease. It had early been observed that the high degree of infectiousness of the disease, under natural conditions, and the well marked virulence of the blood of diseased animals, was out of harmony with the low virulence of the germs which had been isolated, and charged with being the cause of the disease. But as these germs were so constantly associated with the disease and were more virulent than any other forms that were occasionally found, it was reasonable to regard these as the cause, and to ascribe their low virulence to the unnatural conditions of their growth in artificial media. This view, however, was not entirely satisfactory; and experiments were made to determine whether the infectious blood contains some undiscovered element that is capable of producing the disease, when all the so-called hog cholera germs are removed. Accordingly a quantity of highly infectious hog cholera blood was passed through a very fine porcelain filter. A careful examination of the blood after filtration proved that no bacteria were present, that could be discovered by our present microscopical and bacteriological (cultural) methods. But the injection of this filtered blood beneath the skin of swine proved that it had not lost its virulence. It caused sickness when injected into pigs, and the disease produced was identical with that caused by inoculation of unfiltered blood, and similar to acute cases of the natural disease. It was also shown that the disease thus produced could be transmitted from animal to animal without dimunition of virulence, by artificial inoculation of the blood, also that the disease produced by this filtered blood was contagious to other swine by ordinary exposure, as in cases of natural outbreaks of cholera. It was thus proven that there exists in the blood of hogs affected with cholera some living organism that had previously been overlooked, and which the evidence, now adduced, seems to prove is the essential cause of hog cholera. All attempts to cultivate this invisible microorganism by artificial laboratory methods have failed, and the inoculation of rabbits and guinea pigs show these small experimental animals to be insusceptible. Inoculations which we have made at this Experiment Station on horses and cattle with unfiltered infectious blood from swine affected with acute cases of cholera produced no marked ill effects on these animals. The pig alone seems to be susceptible to the pathogenic action of this newly demonstrated "hog cholera-virus;" and swine alone must be used in testing the efficiency of any method that is proposed for immunizing against hog cholera. The above facts have in part led to experiments on immunization which depends upon the *use of the blood serum of swine, that have become immune to cholera,* and the *immunizing power of which is greatly increased by subsequent inoculation of the immune animal with large quantities of virulent blood.*

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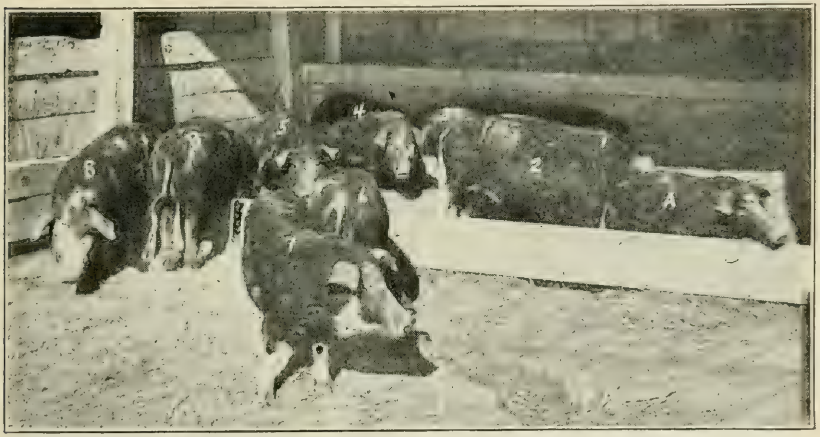
*In Germany, Wasserman and Osterag, working on the same line with the disease, "Schweine seuche," which corresponds to the American swine plague, claim to have produced a protective serum which is now in very large use in that country; being actively promoted by a private commercial concern which manufactures it. The reports from disinterested veterinarians, however, indicate that this method has not proven an unqualified success. The chances of success are more favorable in the case of the German swine plague, since it is not so frequently complicated with hog cholera.

In a number of the infectious diseases, the fact has been demonstrated that when an animal recovers from an attack of one of these maladies it is, as a rule, immune to further attacks of the same disease. And it has been proven in certain of these diseases that an anti-toxic substance is developed which has the power of counteracting in some way the action of the disease producing germs; and, as mentioned in the case of diptheria, this substance can be produced under certain conditions in one animal, and obtained for use in protecting another animal from what might otherwise prove a fatal attack. It is well known that a hog that has once recovered from an attack of cholera proves very resistant when exposed again to the disease. It was then reasonable to suppose that the blood of the recovered hog contains an anti-toxin in sufficient quantity to protect itself against future attacks; that is, to maintain its own immunity. Whether the blood of the ordinary immune hog contains this "anti-toxin" in sufficient quantity to protect another susceptible hog against the disease, by use of the small quantities of serum that would be practicable to use, was a matter to be decided by actual experiment. The United States Bureau investigators, Drs. Dorset and Niles, found that no great degree of protection was produced by this means. And in some inoculations in an outbreak in Cooper county, I found that no appreciable resistance was obtained. The Bureau workers found, however, that the protective power of the blood could be greatly increased by a process of "hyperimmunization," that is, by inoculating an immune hog (one that had been through an attack of the disease) with large quantities of virulent blood. It was found that the ordinary immune hog can resist amounts of diseased blood sufficient to kill several hundred non-immune hogs; and that after this treatment the blood of these "hyperimmunized" hogs had in many cases well marked protective properties, as was shown by



Lot 1. Pigs 1 to 8 "vaccinated." Pigs A and B not vaccinated. Pigs A and 8 died. All severely exposed to cholera. Pigs 1 to 7 all remained well.

the simultaneous inoculation of swine with certain quantities of the serum (20 to 60 c. c.) and of virulent blood (1 to 2 c. c.).

At the request of Dr. Melvin, Chief of the Bureau of Animal Industry, we have been co-operating with the Department in putting this method to a practical test; and it is to this work that I shall now call your attention:

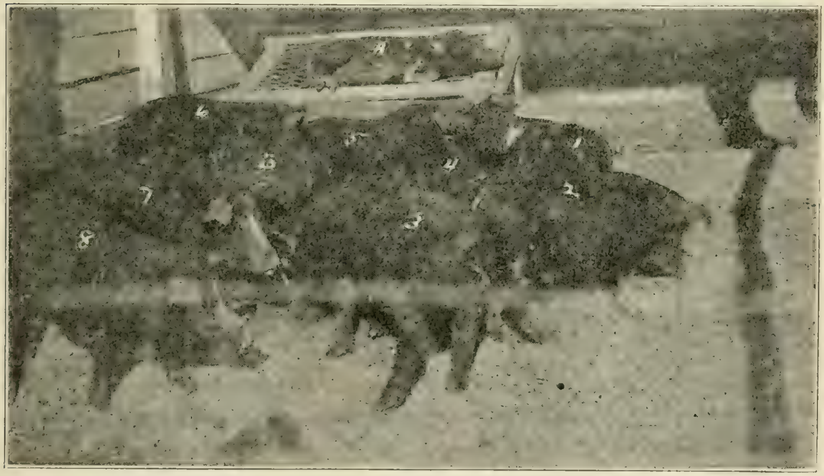
To carry out our experiments properly it was necessary to secure hogs that were susceptible to the disease and were in a healthy condition. We bought in the latter part of September a lot of pigs, 41 in number, that were raised on a farm that is well isolated from the main highways over which hogs are driven and hauled to market; and is thus well situated to avoid an invasion of the disease. The owner claimed that hog cholera had not been on the farm for a great many years. Moreover this farmer was not in the habit of buying many breeding hogs for improvement of his herd. He was content to add a male hog every two or three years. By this means his herd had escaped cholera for many years and was probably more susceptible to the disease than many of the herds of the country. To be well assured that the hogs were healthy they were kept under observation for sometime before the immunizing experiments were begun.

To test their suceptibility, and at the same time to secure fresh virulent blood for use in connection with the immunizing experiments, two of the hogs were inoculated with virulent blood that had been preserved for some time in sealed tubes. Both these pigs died from an acute attack of hog cholera, thus showing the probable susceptibility of the entire lot.

The remaining hogs were divided into four lots and placed in separate but adjoining pens, with close board partitions between. The north end of the pens was well sheltered and the south end exposed to the sun and weather. Close-mesh chicken wire was put over the exposed portion of the pens to prevent birds or dogs from carrying infection out or into the experiment pens. So far as the hogs were concerned the conditions of shelter, exposure, food and general care were the average of those found on stock farms. The test was designed to meet practical conditions.

A summary of the results of the inoculation of those four lots is as follows:

In lot I (pen 3) 10 pigs, weighing 40 to 60 pounds, were placed. October 22, 8 head were injected with 20 c. c. of serum B. A. I., from hyperimmunized swine. At the same time each hog was injected with 1 c. c. of fresh virulent hog cholera blood. Two pigs received no treatment, but were left to determine whether the disease would spread from inoculated hogs to those not inoculated. Another pig was inoculated with the infected blood, used on the 8 head mentioned, to determine whether it was virulent. This pig was put in a pen well isolated from the others, and died November 1 from symptoms of cholera, which was confirmed by the post-mortem examination. November 27, one of the "check" pigs that had not been inoculated with serum or virulent blood appeared sick. Two days later, one of the vaccinated pigs of this lot was also sick. The check pig died after a very lingering illness. The vaccinated pig also died at a still later date from an abscess, and there may be doubts as to whether this pig was affected with cholera, although there can scarcely be any doubt in regard to the check pig. The infection probably did not come in this case from the inoculated pigs, but from lot 4, as shall be explained later. All the other pigs of this lot remained perfectly healthy, including one of the check pigs which had not been inoculated. On December 10th all the pigs of this pen were exposed to the natural disease, by placing two sick pigs from a natural outbreak of the disease in the pen with these animals. One of these pigs died the 24th and the other on December 28th. A post-mortem examination showed a mixed type of cholera and swine plague. These pigs were under daily observation, and up to January 24th no ill effects were seen from this exposure. On this date, two pigs of this lot were fed viscera obtained from hogs, which had died from a natural infec-



Lot. 2. Pigs 1 to 8 "vaccinated;" all remained healthy. Pigs A and B, not vaccinated, died from cholera. All severely exposed to cholera.

tion of cholera, on a farm several miles from the Station. The feeding of the diseased organs had no bad effect on the vaccinated pigs mentioned, and none of the other vaccinated animals exposed to them have shown any signs of illness up to the time of issuing this report.

Lot 2—Lot 2 included 10 pigs, weighing from 40 to 60 pounds, eight of these were injected with 20 c. c. of the protective serum (B. A. I.), and simultaneously with 2 c. c. of fresh virulent hog cholera blood. A larger quantity of diseased blood was used in this case to determine the protective power of the serum, with varying doses of the infection. This blood was shown to be virulent when used on pigs not protected with serum. These inoculations were made October 22. As in lot I, two untreated check pigs were placed in the pen. Up to November 16, twenty-five days after inoculation, no disease was observed in any of the pigs. On this date one of the pigs which had not been vaccinated became sick and died on November 24th, after an illness of eight days. The symptoms and post-mortem examination showed the presence of cholera. On November 22nd, the second check pig became sick and was killed December 2. Post-mortem examination showed hog cholera lesions. The check pigs, it is certain, did not contract the disease from the pigs of the same pen that had been injected with both serum and diseased hog cholera blood—but probably got the infection from an adjoining pen (see lot 4). December 10 all the vaccinated pigs were doing well. None had shown any signs of illness. On this date two sick pigs from an infected herd were put in this pen. Two days later one of them died. The other, after several days' illness, recovered. This exposure caused no ill results to the vaccinated pigs. On January 24 two of the vaccinated hogs of this lot were fed diseased viscera from the same source as that mentioned under lot 1. No ill effects resulted to the animals fed, nor to the other pigs exposed to them. All of these vaccinated pigs are, at the present time, alive and in thrifty condition.

Lot 3 (pen 4) contained eight pigs—weight 40 to 60 pounds. October 22, each pig was injected with 20 c. c. serum from same source as that used in lots 1 and 2, but the infected hog cholera blood that was injected at the same time was not freshly collected, but had been preserved for some time in sealed glass tubes. This was sent to us by Dr. Niles of the Bureau; but I was advised later by Dr. Dorset of the Bureau not to use this on account of an unfavorable report that had been received. The unfavorable results were at this time thought to be due to changes that had taken place in this old infectious blood. I deemed it important, however, to test this preserve blood since in practical work in the field, it is often inconvenient to obtain fresh infected blood each time it is needed. Moreover the delay of a week or more in securing fresh infection may at times prove a serious delay. In this lot, three pigs were injected with 1 c. c. of the "preserved" infection and five pigs received 2 c. c. No ill effects were observed from the inoculation of the serum or from the preserved infectious blood, in the different quantities mentioned, when the immunizing serum and the infected blood were used simultaneously. To test the virulence of the "diseased" blood, another pig was inoculated with 2 c. c. of the same preserved infectious blood (without the simultaneous injection of the "protective serum"). This pig died 10 days later from an acute haemorrhagic type of cholera.

Lot 3. Pigs 1 to 8 all "vaccinated" and severely exposed to hog cholera. None became sick.

The vaccinated pigs which had also been injected with the same diseased blood showed no signs of illness. On December 2, our records show that all the vaccinated pigs of lot 3 have remained in good health from date of inoculation, fifty-one days before. December 12, all the pigs of lot 3 were exposed to natural hog cholera infection by putting in the same pen a pig that was suffering from the disease. December 28th the sick pig mentioned died. The autopsy showed the haemorrhagic type of hog cholera, complicated with broncho pneumonia (swine plague). December 29, two more sick pigs from an infected herd were placed in this pen. Both these recovered. Up to January 24th, none of the vaccinated pigs had shown any sign of illness. On this date two of the vaccinated pigs of this lot were fed diseased viscera—spleen, liver, and intestines, from pigs that had died from the natural attack of cholera. January 28th, through a misunderstanding on the part of the assistant, this entire lot, including the two that were fed the viscera, were inoculated two days later with 1 c. c. each of infected blood, from a pig that had died from a natural attack of cholera,* and in which the typical lesions of the disease were found; as ulceration of the bowels, enlarged spleen, swollen and haemorrhagic lymph glands, and haemorrhagic spots on the surface of the kidneys. Nothwithstanding this very severe exposure not one of these vaccinated pigs has shown the slightest symptoms of illness of any kind.

Lot 4 (pen 1). In this lot were nine pigs, varying in weight from 35 to 70 pounds. Six of the smaller ones averaged about 50 pounds; the three larger ones were gilts, one of which was pregnant.

This lot of hogs was used in an experiment to test the "immunizing value" of the blood serum of a hog that had become immune to cholera through a natural attack of the disease; and had been fed from time to time over a period of two years with large quantities of viscera (spleen, liver, intestines and kidneys), from hogs affected with cholera (from natural attacks), with the view of increasing the acquired immunity. It was to be presumed that an animal so treated would acquire some degree of "hyperimmunity" and would produce a more potent serum than the ordinary "recovered" immune.

October 22 six of the smaller hogs of lot 4 were injected with 20 c. c. of freshly drawn serum, from the "viscera-fed immune" mentioned, at the same time these six hogs were injected with virulent hog cholera blood; three with fresh hog cholera blood from the same source as that used on lots 1 and 2. The other three were injected with preserved hog cholera blood from the same source as that used on lot 3. The infectiousness of this blood was shown by its fatal effects on two pigs that were injected with this alone, and isolated from any other source of infection.

November 4, thirteen days after the vaccination of the six pigs of the above lot, three of the vaccinated pigs seemed to be sick, and seven days later (November 11), one of the sick vaccinated pigs died; this one had been injected with 20 c. c. of serum from the "viscera-fed" immune hog, and simultaneously with 2 c. c. of fresh infected blood. The autopsy showed an acute haemorrhagic case of hog cholera. The other two sick pigs recovered; one had been injected with 1 c. c. of the *fresh* virus, and the other with 1 c. c. of the *preserved* virus. The remaining three vaccinated pigs never showed any signs of illness from the simultaneous injection of virulent hog cholera blood. One of these pigs received 2 c. c. of the preserved blood; another, 1 c. c. of preserved blood, while the third received 1 c. c. of the fresh virus.

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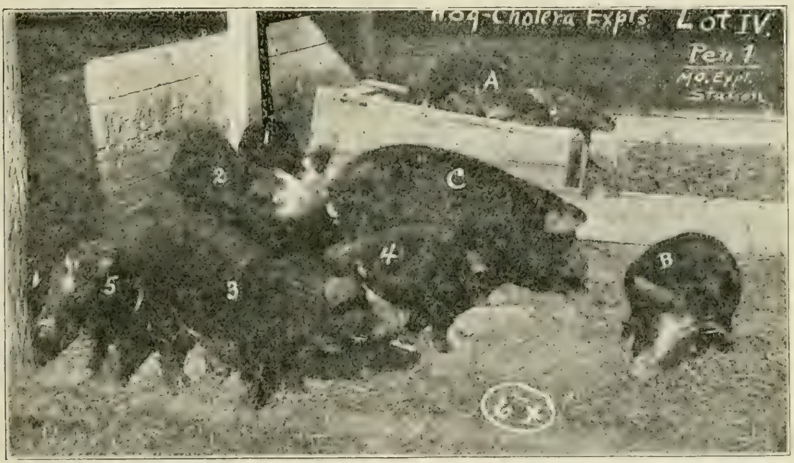
*Gentry Clark herd.

The two "check" pigs, and the pregnant sow, which had been left in the pen, and had not been injected with either serum or infectious blood, all contracted the disease in the natural way by simple exposure to the sick vaccinated pigs. The first signs of illness in these "check" pigs occurred on November 16th, twelve days after the first symptoms of sickness were observed in the vaccinated pigs. Three days later (November 19th) the remaining non-vaccinated hog was "off feed." November 21 the pregnant sow aborted. On November 23, after an illness of several days, one of these sick pigs died, having shown during this time the usual symptoms of cholera; as, loss of appetite for food, great thirst, emaciation, great weakness, unsteady gait, shivering as if cold, tendency to burrow under the bedding. The autopsy showed: congestion of the lymph glands, small blood spots (petechiae) on the serous coat of the small intestines and on the kidneys—a number of small ulcers on the mucous surface of the blind gut (caecum); mucous surface of the intestines greatly congested; small blood spots (petechiae) on the pericardium; the lungs were in fair condition. November 26 check pig No. 2 was desperately sick, and was



Lot 4. Pigs 1 to 6 vaccinated from "viscera fed" immune—pig No. 6 died. Nos. 1, 2 and 3 remained healthy, 3 and 4 sick, but recovered. Pigs A, B and C not vaccinated. All these "check" pigs died.

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*To the time of issuing this report these pigs have remained in the same pen over 150 days and have shown no evidence of sickness.

slaughtered to obtain blood for experimental purposes. The autopsy notes are very much like those reported above, except that the spleen was more enlarged and the lungs showed a slight infiltration at the inferior borders of the anterior lobes. November 30 the third non-vaccinated sow died; this was the sow that had aborted.

The three vaccinated hogs that showed no signs of the disease were thus continuously exposed for twenty-six days or more in very close contact with the hogs suffering from the disease. These and the two recovered pigs were further exposed by putting with them December 9th a sick pig from an outside pen. This pig recovered after a prolonged illness. In the meantime it had doubtless added considerable infectious material to the pen. No harm came to the vaccinated pigs from this additional exposure.

January 24th one of the recovered pigs and one that had never shown any symptoms of cholera, in lot 4, were fed viscera (spleen, liver, intestines and kidneys) obtained from hogs that had died from cholera in a herd suffering from a natural outbreak of the disease, and in which both the hog cholera and swine plague types were present.

The two pigs that were fed the viscera suffered no ill effects, nor did the other vaccinated pigs of the same lot that were exposed.

In lot 4 it will be seen that only one of the six vaccinated hogs died, and three showed no illness, while five non-vaccinated hogs of the same breeding that were inoculated or exposed to the same infection died. It therefore seems that the serum used in this case had some power to protect against the disease. Its potency, however, was not as great as the serum obtained from supply animals made "hyper-immune" by hypodermic injection of a large amount of infectious blood, as is shown by comparison of lot 4 with lots 1, 2 and 3. In the last named lots of 24 pigs only one showed any signs of sickness. This one in lot No. 1, died after a very lingering illness. A large abscess had developed under the throat. While the symptoms indicated a case of cholera, the post-mortem in this animal gave no clear evidence that the death was caused by this disease. The non-vaccinated animals in these lots, with the exception of one check pig in lot 1, died from the disease. This one at no time showed the slightest illness. The reason for this resistance of the non-vaccinated pig I am unable to explain. Such occurrences, however, are observed in natural outbreaks of the disease. I think it very probable that the check animals which died in pen 1 and 2 contracted the disease from infection carried into these lots from lot 4 by the attendant, who, in feeding and caring for these pigs passed from pen to pen without any disinfection of his shoes. This was done intentionally (after the outbreak of the disease in lot 4) as it was evident that the opportunity for infecting the "check" pigs in lots 1 and 2, in other ways, from lot 4 would throw doubt on any conclusion that these "check" pigs contracted the disease from the vaccinated pigs of their own lot, should the latter remain healthy. In this way a greater exposure of all the vaccinated pigs was made than was at first planned.

We may also regard the sick pigs of lot 4 as "checks" on the value of the serum used in lots 1, 2 and 3, since the source of the infection in lot 4 was from the diseased blood used in the other lots. I am confident that all of the pigs in these several lots had far greater opportunities for contracting the disease than ever occurs in a natural outbreak of cholera.

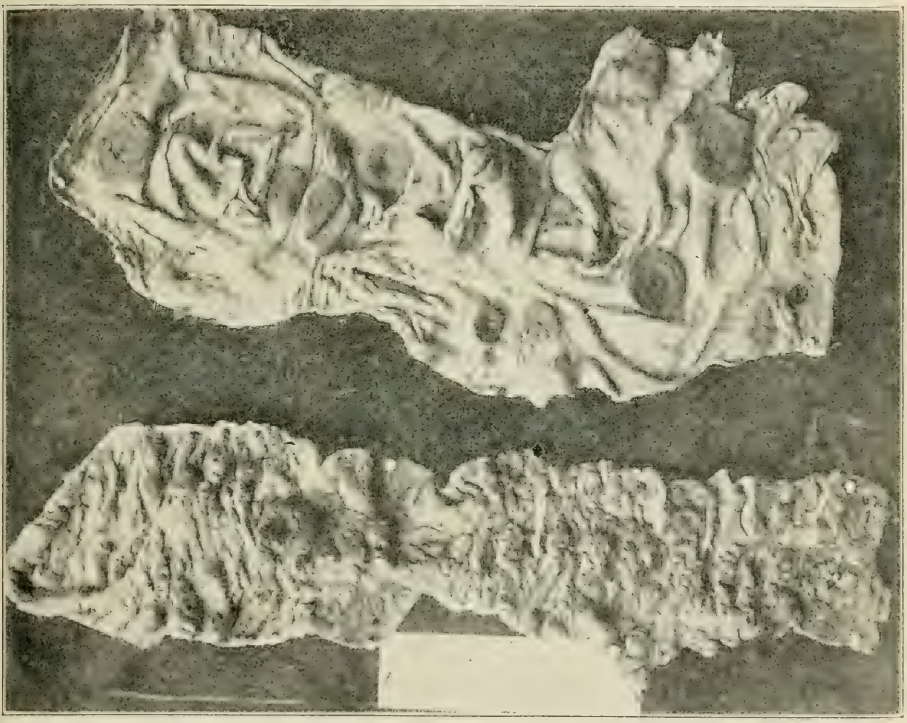

Fig. 5. Hog cholera ulcers—Intestines—Vet. Dept. Mo. Experiment Station.

We had an opportunity of still further testing the value of the "hyperimmunized" serum in an outbreak of cholera in the State farm herd, into which the disease had been introduced by some hogs of the "show herd" which had returned recently from the

State Fair. A few days after the return of these animals one of them, the Berkshire herd boar, died somewhat suddenly. The herdsman, not suspecting an infectious disease, and thinking the animal had probably been injured or over-heated, did not call my attention to the matter for several hours after the animal had died; and it was impossible to give a positive diagnosis of the case, since decomposition was well advanced before the examination was made. My suspicions, however, were aroused that the case was one of acute hog cholera. These "show hogs" had been unloaded in an inclosure where the general farm herd ran from time to time. On November 8 a Duroc gilt that had been exposed with a number of others upon these grounds, died during the day. The autopsy showed highly injected lymph glands, enlarged and soft spleen, great congestion of the mucous membrane of the intestines. Two days later a Duroc sow, "Nokomis," that had been at the State Fair died. The post-mortem examination of this animal gave evidence of cholera. November 13 we inoculated 27 of the choicest of the breeding herd with mixed serum supplied by Dr. Niles from some of the Bureau's hyper-immunized hogs. In addition to this we inoculated all of the surviving hogs that had been taken to the State Fair—5 head. One of these was very sick at the time, and the other, her bed mate, was not eating well; making a total of 32 of the farm animals inoculated with the above material. We gave to the large animals doses of 60 c. c. of the serum. This had no good effect upon the *sick* sow, "Lucy Lee," nor her bed-mate, "Early Rose." Both of these died from the disease. Two large Duroc boars and one large Poland-China sow of the show herd showed no signs of illness following the inoculation. They were not taken from their pens which were adjoining the pen in which the other animals died. They were also cared for by the same attendant who had charge of the two sick sows.

We lost out of the 27 of the general farm herd only one large sow. This sow had been inoculated with only 40 c. c of the serum. She was suckling 6 pigs at the time. These also died. A large Duroc sow, suckling 11 pigs, but which received a larger dose, 50 c. c., and running in the same pen, showed no signs of the disease, although all of her pigs died from the disease. Another sow in an adjoining pen which had also received 50 c. c. of the serum, and was suckling 6 pigs, showed no signs of the disease, although her pigs died from cholera—the pigs of all three sows went back and forth to infected pens near by. None of the other animals mentioned have shown any signs of illness. Thirteen of the choicest gilts were removed some distance from the grounds for further protection. These were all inoculated with 40 c. c. of serum each. These animals, however, did not escape opportunities for infection, since the same attendant who cared for the sick farm hogs, also fed and watered these. Moreover some of these gilts were driven over the infected grounds to the pens of the boars mentioned above for breeding. During this time a number of hogs that were not injected with the serum died from cholera. Our observations show that the serum is not effective when inoculated into an animal which is showing symptoms of the disease, but it shows a very high protective value in preventing the development of the disease.

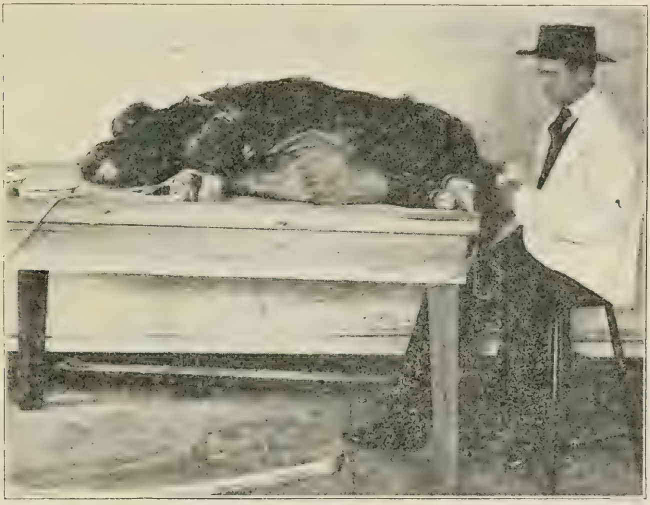

Fig. 6. . Disinfecting the tail preparatory to drawing blood.

A further test of the serum from the hog made "hyper-immune" by feeding diseased viscera was also made upon three other lots of hogs on the State farm. In one lot, No. 5, consisting of four Duroc gilts weighing about 150 pounds each, two were inoculated with 40 c. c. each of *clear serum,* and at the same time were inoculated with 2 c. c. of virulent blood from one of the check pigs that had died in lot 4 already mentioned. Two more were inoculated with the blood *corpuscles* tolerably free from serum, in doses of 40 c. c. each. These were also inoculated with 2 c. c. of the same virulent blood. One check animal of the same litter was not inoculated. All of these animals contracted the disease, and all but one died. The post-mortems showed evidences of a very acute septicemia, corresponding to the haemorrhagic type of hog cholera. The infected blood used on this lot was not drawn under the most favorable condition, and there is a possibility that other infection besides the hog cholera virus was also present. The object of the inoculations in this lot was to compare the protective value of clear serum and corpuscles.

In lot 6, inoculated on the same day with the same serum, were seven Duroc boars. Two of these were inoculated with 40 c. c. of the serum, four received 30 c. c.; the fifth animal, a small one, was quite sick at the time of the inoculation. This one received only a small dose as the quantity of the serum available was not sufficient to give a larger dose. With this lot three hogs were not inoculated: One, a Berkshire boar, was sick at the time; the other two, a Duroc boar and a Berkshire barrow, were not showing any signs of illness. All the sick animals mentioned and the two apparently healthy animals, not inoculated, died some time later; while only one of the six Duroc boars which appeared to be healthy at the time of the inoculation succumbed to the disease. As these animals were all on infected grounds and a part of them had the disease, the vaccinated animals were not injected with virulent blood.

In lot 7 were nine animals. Five Berkshire sows were inoculated with 40 c. c. of the serum, one Berkshire sow 30 c. c., one Berkshire gilt 20 c. c., one Poland gilt 40 c. c., one Duroc gilt 20 c. c. As these animals had an opportunity for natural infection, they were not inoculated with virulent blood. None of this lot died.

In regard to the technique of collecting the serum and inoculating it into the hogs, the following description and the accompanying illustrations will help to make the matter clear:

After the supply animal is made "hyper-immune," the collection of the blood is made from the tail on account of the difficulty of tapping the deep-seated jugular vein. The animal is cleaned well and tied firmly to an operating table, made convenient for this work. To prevent contamination of the serum, the tail of the animal is made thoroughly clean by shaving off the hair and applying antiseptics. A bit of the tail is then cut off and the blood collected from the bleeding end in a sterilized vessel, the mouth of which is carefully protected by a sterile towel. A cover is also drawn over the pig in such a manner as to prevent any contamination from the hair and skin. After the blood has been collected the clot is removed and the blood that remains is preserved by adding a small quantity of carbolic acid (½ per cent), or the blood may be used at once in the fresh condition. As to the keeping qualities of the serum, Dr. Dorset has informed me that he has had samples that have retained potency for several months.* The main drawback to the use of the hog as a supply animal, in addition to the inconvenience of collecting the blood, is the difficulty of supplying large quantities in case of great outbreaks of the disease, since only small quantities of blood can be secured from the hog at one bleeding—only from 300 to 500 c. c. can be secured at one time, and this is only sufficient for fifteen or twenty hogs at a minimum dose. If our attempts to make the horse and ox serve as supply animals are successful, the drawback mentioned will be overcome. But even if these larger animals do not prove appropriate for supplying the serum, great service can be done the breeders of pure bred swine through the present method, since the serum appears to retain its immunizing properties for a considerable time and can be collected and stored up for use during the seasons when the cholera is not so prevalent. It is the purpose of our own Experiment Station and College to serve the swine breeders of the State to the fullest extent possible along this line. Our conveniences for doing this

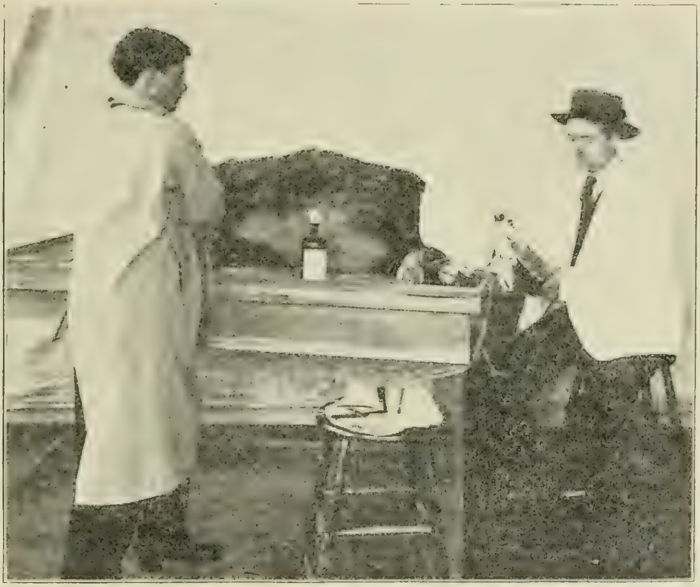

Fig. 7. Drawing blood for inoculating purposes, Veterinary Department, Missouri Experiment Station—Niles method.

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*In the Rinderpast inoculations of cattle in South Africa, after which this work on the hogs is planned, Drs. Turner and Kolle had samples of serum that were effective two and one-half and three years after they were collected.

work in the most efficient manner are not at present adequate; but I am sure that everything needful for the best work will be supplied, because of the great importance of this line of work.

From your knowledge of the fact that hog cholera presents such varied symptoms which suggest varied causes, the question may arise in your minds: Will the immunizing process which we have been discussing suffice for protection against these various forms? As already mentioned, it is my opinion that we have probably only one true cause for the various types of epizootics affecting the hogs of this country; but that, associated with this, the hog cholera germs and the swine plague germs acting in a secondary role, give rise to some of the symptoms and lesions noted in the various types of hog cholera, but it is probable that these secondary causes are harmless in the absence of the true cause, which is found in the "filterable virus." And I think that experience will prove, as our experiments indicate, that we have practically only one disease to combat; and that in the method which I have been describing we have an efficient means. In support of this I recall your attention to the fact that the experiment pigs in lots 1 to 4 were exposed to the "acute haemorrhagic type" of the disease, to the "slow-and-lingering" form, and to the "swine-plague" type of the disease and proved resistant to them. While there is yet a difference of opinion as to "swine-plague" being an independent disease (and even if it should prove to be so) the losses from this cause will be materially lessened because in most cases where this form is noted, the hog cholera type is nearly always present; and the mitigation of the disease by overcoming the "hog cholera" type will doubtless lessen the force of "swine plague" with which it may be associated.

Moreover, in the preparation of the serum, the supply animal is treated in a way which in fact produces in some degree a "polyvalent serum" which may be effective against the *secondary causes* mentioned. In the infected blood, which is used in the inoculation of the animals to be "hyperimmunized," *unfiltered* blood is used. It thus contains not only the "filterable virus," but also the old hog cholera germs or swine plague germs with which the diseased animals supplying this affected blood may be invaded.

Another question which may arise in your minds: Is it necessary, in order to secure a permanent immunity, to inoculate the animals with diseased blood at the time they are inoculated with the serum. Experiments have shown in other diseases that when animals are inoculated with the protective serums alone, their immunity is of a passing nature; and that for the production of a permanent immunity the animal must be infected either from exposure to the disease or by actual inoculation with the virus. If this is done at the time the protective serums are present, no severe results follow, and the animal acquires an immunity which is quite permanent. In practical work in the field I hardly think that it is necessary, where animals are already exposed to the disease, to resort to the inoculation of the virulent blood. In the cases we have already mentioned on the State farm, we did not think it necessary to inject the virulent blood on account of the probability of the animals becoming infected through natural means. Dr. Niles, writing me on December 14th, says in regard to this matter —"The results of our field work have been most encouraging, and we are satisfied that serum used *alone* in herds in which disease is just starting, will save a very large majority of the animals."

We must not overlook the importance of the ordinary sanitary measures in the prevention of this disease, for in the history of plagues of all kinds more has been done by good sanitation than by vaccination. In small-pox, diptheria, bubonic plague, and other infections, Boards of Health do not relax in the least the enforcement of quarantine and disinfecting measures, although there are vaccines against some of these human maladies; and if the farmers would apply the proper sanitary measures in the handling of hog diseases the losses would not be so great. For instance, the good effect of quarantine will be illustrated by the experience of one of the members of this Association, whom you all know. I refer to Mr. Gentry, who tells me that he has a number of times prevented great losses of hogs in his herd by placing in temporary quarantine those that he had shown at the various State fairs. It became his custom, after a sad experience or two with hog cholera, to put the "show herd" apart from the general herd for a few weeks after their return to the farm, and to put these in charge of an attendant who did not come in contact with the other hogs. He has brought the disease on to his farm a number of times, but has succeeded by strict quarantine measures, and thorough disinfection, in preventing its spread to the other hogs on his farm.

The free use of disinfectants like carbolic acid and quick lime are very important in the prevention of this disease, and in stamping it out, when it once invades a farm. *Thoroughness* of disinfection is the important thing. A slight sprinkling of lime here and there does not suffice; you must make the yards look as if a snow had fallen. One of the members of this Association, Mr.

Garrett of Maryville, a prominent breeder of Poland-China hogs, has told me that he has been able to bring in new animals within a very few weeks after he had had the disease on his place, by the liberal use of quick-lime in disinfecting the grounds. But he said, "I did a thorough job of it." It is well in an outbreak of this disease to separate the apparently healthy hogs from those that are diseased; and to divide the healthy lots into several smaller bunches and place them in separate pens on clean grounds. In this way if only a few of the number are infected the opportunities for a general spread of the disease is lessened. The dipping of the hogs, that have been exposed, in any of the carbolic dips which are in general use, is another measure which will aid in preventing the spread of the disease.

The spread of hog cholera is greatly augumented by the neglect of the swine owner to burn the carcasses of animals that die of this disease. Many a wide spread outbreak could have been prevented had the proper measures been employed. In the fall of the year it often happens that a farmer who has raised a good corn crop and does not have a sufficient number of hogs to dispose of it, buys a carload of hogs in some distant part of the State. The exposure of these hogs to infection in the local stock yards of the region where they are bought, often starts the disease in the lot within a few weeks. The farmer ascribes the disease to the feeding of new corn, or to other causes than the real one. The hogs lie around unburned and the infection is distributed to neighboring farms, by the drainage to lower lying places, by dogs and birds carrying diseased parts away, and in other ways.

We have laws in regard to hog cholera and other contagious diseases which provide that animals dying from a contagious disease shall be burned or buried, and that notice shall be given the neighbors in regard to the presence of the disease on the farm. It is also a misdemeanor to permit these sick animals to run on public roadways or the commons. These laws, however, are not known to many farmers, or their importance is not appreciated, since it is too common an occurrence to find during an outbreak of this disease, hogs lying rotting in the streams that run through the infected farm.

In regard to medicinal treatment, I know of nothing better than that recommended in the Farmers' Bulletin No. 24, issued by the United States Bureau of Animal Industry. The various proprietory remedies that are on the market are made up of practically the same ingredients.

In combatting hog cholera by means of "preventive inoculation" there is doutbless much work yet to be done, to make this procedure as practical as is desirable. But it is certainly gratifying to know that the outlook for an entirely successful issue of the long and arduous labors of the United States Bureau on this line is so bright. And it is certainly a matter of no little profit as well as pleasure to us to have had some part in this work.

We wish to assure the swine breeders that the Missouri Experiment Station has enlisted for the entire campaign in the war against hog cholera.

SESSION

Missouri Sheep Breeders' Association.

January 7th, 1908.

THE CARE AND MANAGEMENT OF THE FLOCK.

(E. B. Wilson, Stanberry, Mo.)

The subject, Care and Management of a Flock, is one which has been discussed time and again and very likely much of what I have to say has been said by others in meetings of this kind.

My observations of the care and management of a flock have all been made in Missouri. I trust that this will be of some value to the new beginner in Missouri at least. (In starting in the sheep business, whether it be a pure bred flock or grade flock, we should not be satisfied with anything but the very best ewes we can buy. Buy young ewes if you can get them. Look well to size, form and covering. In this day of high priced wool a few pounds per head makes quite a difference in the profits at the end of the year. In selecting a ram, we should buy the best we can find. The best is none too good, and don't let a few dollars keep you from buying a good ram. When breeding time comes have your ewes in a healthy condition. One ram should be used to every forty or fifty ewes, unless we hand breed. In this case one ram to about sixty ewes. What I mean by hand breeding is to let rams serve each ewe but once. But this would be a great deal of trouble in a large flock. After the breeding season is over we should take rams away from the ewe flock.

We should see that our flock has plenty of pure water, also feed them well. Don't feed too much corn to pregnant ewes. I have seen breeders who thought they were feeding their ewes in the best possible manner by giving them all the corn they can eat.

Corn is all right for fattening lambs, but for breeding ewes we should use but very little corn. Pregnant ewes require feed for muscle and bone building, such as oats, bran, clover hay, etc. By feeding corn and timothy hay the fleece seems to get harsh and dry and the sheep will lose flesh. Experience teaches us that a change of feed occasionally is beneficial. They also enjoy a change of pasture and we find that it certainly does them good.

The question of barn room for pregnant ewes is of great importance. No class of live stock needs room more than the pregnant ewes. They not only need plenty of room, but they need and must have plenty of fresh air. Don't confine them to small quarters that are poorly ventilated. If they are shut in close quarters, they will, upon coming out in the cold atmosphere, contract colds, and we find colds and catarrh a source of trouble.

For fear of abortion never let ewes crowd through narrow door ways. Another cause for abortion is ewes eating too much salt. This only happens when the ewes have not been regulary and properly salted. The proper way to salt a flock is to keep a box of salt in some part of the barn where they can go to it any time.

We find by experience that a ewe and lamb should have twelve or fifteen square feet of barn space. Will also say while on the subject of close confinement, we should never let our sheep stay in muddy, filthy lots, lest we have trouble with foot-rot. Keep plenty of bedding in the barn and let the sheep have the run of the pasture as much as the weather will permit.

During the winter time nice bright corn fodder is an excellent feed to scatter out in the pasture in the day time. This is a good way to make them take exercise. By having good warm quarters it is best to have lambs come early. February and March is a very good time to have them come. By coming early and teaching them to eat they get a good start by time grass comes, and are less liable to sickness and disease. If the lambs are intended for market, feed them plenty of corn and get them to market early. If they are intended for breeding purposes, feed them bone and muscle making feed. Make them as large as possible without too much fat. By doing this we have a good size as yearlings. Then the yearling ram is ready to do good service. The yearling ewes are ready to breed when breeding time comes. It is advisable not to use the ram under one year of age, and the ewe should never be bred under one year.

A SHEEPMAN'S EXPERIENCE IN THE MISSOURI LEGISLATURE.

(Hon. H. R. Brasfield, Unionville, Mo.

MORE SHEEP OR MORE DOGS—WHICH?

If any one thinks it is an easy matter to get a dog law through the Missouri Legislature, he is sadly mistaken.

The committee to which the bill for a dog law was referred consisted of seventeen members. I had made a considerable canvass among them and felt discouraged and called for help from Brothers Carroll and Boles, but when the committee met that night for a hearing on the bill there were only nine members present. After some good talking by Mr. Carroll, Brother Boles took the floor, and in his convincing way told the committee the importance of the law. One of the committee said to Mr. Boles, "If you men want to raise sheep, why don't you fence against the dogs?" Well, you could see the hair on the top of Mr. Boles' head rise and turn red and his eloquence grew loud and strong. He failed to convince that member enough to get his vote at that meeting, but we *did* get it at the final vote and got twelve out of the seventeen on the committee. There were a number of members who wanted to vote for the bill, but were afraid to vote either way, so made a *sneak* and had business of importance (?) in some other place when the vote was taken. At that committee meeting we got five votes from the nine members present. I learned later on that we got all the votes that we could have gotten from that committee that night—our work had just begun.

DOG-INSPIRED ELOQUENCE.

I have had quoted to me during this dog law fight every "dog poem" and every great and famous "dog speech," I think, that has ever been made; and one could have heard more dog oratory in both House and Senate than any one could imagine could be produced on that subject. To hear the arguments produced, you would think this great State of ours could not exist without dogs; the business of the merchants, farmers and all would have to be suspended if the law passed. I heard one representative say he would not vote for it if every man in his county would ask him to do so. (And I was glad to see that his county was one of the first to adopt this law.) I heard two senators say it was an outrage on the poor to pass such a bill. I was pleading with one senator and showed him that every representative from his district had voted for the bill, and told him of the many petitions that had come in from his district asking for the enactment of the law. After hearing me he said, "Well, Bob, it is a bad law and I can not vote for it."

POWER OF ORGANIZATION.

Well, we got a part of our bill enacted into a law by the aid of the great army of enforcement that I had in the background commanded by Capt. M. V. Carroll, and the members of that army were the Missouri Sheep Breeders and their friends.

Now we can see the advantage of an organization. There were four or five dog bills introduced in the last legislature and all died a chilly death but one, and it was badly treated. One representative, who introduced one of the bills, came to me and said he had a much better bill than I, in his judgment, and he could not understand why there were so many petitions coming in for the Brasfield bill. Our organization was young but it did some great work.

I was requested by our secretary to secure a copy of the petitions that came in on House bill No. 92. I found it would be a big job. I believe there were more petitions came in before the House and Senate asking for the passage of House bill No. 92 than any other bill that was petitioned for during the two terms of the last legislature. We could have done nothing without our organization. It means education. To us farmers it is squarely up to us in open broad daylight. Do we wish to protect one of the greatest farm industries, one that will bring wealth to the amount of the capital invested if properly cared for? Farmers, do you know that every farmer in this State should have a flock of sheep according to the size of his farm? His farm would look better, it would *be* better by having them there. Those obnoxious weeds would not take his place and make it look like some "widow woman" owned it, besides his land would be reaping a reward by being enriched, and the farmer's bank account would increase and, at the same time, miss but little that they eat.

HOW CONVERTS ARE MADE.

I know I have been abused and called hard names over the enactment of the dog law, and I have had to take the abuse. Little do the people know that I was backed by such a great force as the Missouri Sheep Breeders' Association.

In some parts of my own county there has been some dissatisfaction. One farmer, who has long been a successful sheep raiser and who has secured a large tract of valuable land from his success and had never had the misfortune of having dogs get into his flocks, said some mean things about me and the dog law. I saw him a short time ago and he said, "I was opposed to your dog law but have just had $25.00 worth of sheep killed and, if your dog law was in force, I could get my money back. I am ready to sign a petition for the dog law, for now I see where you are right. There is no income whatever from the dogs; from my sheep is where I get clothing for my family and money to buy land." He also said, "I know a number of men who own farms and who always keep a gang of dogs. They never owned a sheep in their lives and do not know their value, but they *do* know how to love a dog."

I find a majority in the House and Senate are willing to vote, personally, for a dog law, but are afraid of their job. Now, what we have to do is to go to work and keep this sentiment growing. We have done a great work in a short space of time. The stock law that we now have in most every county in the State was not carried in the county in whhich I live for a number of trials, but we at last succeeded. The votes for very few of the fine court houses that are in many counties in our State were not carried on the first trial, some not even on second or third, but when the people were convinced that was the right thing to do, the votes counted. Now we have only got this enterprise started. We did not get a whole loaf, but a slice, and we must keep the ball rolling till we get a whole loaf. I was satisfied the validity of the bill would be questioned, and it has been by one judge, but he is only one man and not final. I have had the matter examined from one end to the other by competent lawyers, and there was but one point of question in it, and I am confident that point would be sustained by the Supreme Court on a point of justice and equity, governed by police regulations. The law does not call for a *tax* but a license.

A man has to pay a license to have the privilege to keep a dog. Nearly every city and town in the State has a dog license—if they pay it there, why not have it in the county and make it general?

FEWER DOGS—MORE BREAD AND BUTTER.

It will not be a hardship on the poor—if they would keep less dogs they would have more for their families to eat. It is the dogs that are kept and not fed that cause us so much trouble. They must have something to eat, and in roving over the country hunting for something to eat, two or more get together and commence to run stock and do such great damage. It is not always what they kill that makes the big damage. I heard of one raid lately where dogs killed six or seven sheep and damaged and crippled about a hundred more in one flock. Every sheep in the flock is seriously damaged in such a raid, and it sometimes takes weeks to get them back where they were if they are *ever* as good and gentle as before.

Many times great damage is done to sheep by dogs hunting on our farms and scaring the flock when the dog does not mean to do damage.

Now, in my judgment the best thing for Missouri farmers is a flock of sheep on every farm. *More sheep, better sheep and fewer dogs.*

WHAT ORGANIZATION HAS DONE FOR THE MISSOURI SHEEP INDUSTRY.

(M. V. Carroll, Secretary of Missouri Sheep Breeders' Association.)

In this practical commercial age trees are judged by the fruit they produce, men and organizations are estimated by their capacity to do things, to show results. I am told by Missouri's pioneer sheep breeders that many years ago—just how many was not stated—there was an organization of sheep men in this State, but what became of it, what it accomplished or what the cause of its demise, I am unable to state. Certain it is that the decade ending at 1906 was one of sepulchural quietude in Missouri so far as the sheep industry was concerned. True, there were a few courageous, enterprising sheep breeders here and there over the State whose operations, while measurably profitable, served largely to inspire curiosity among their sheepless neighbors. While Uncle Sam's census compilers professed to find within the State a considerable number of sheep each year, our wool production was so much a minus quantity that the Yankee wool buyers would not concede that Missouri was on the map. The Missouri State Fair held its first annual exhibition in 1901, and possibly, with two or three exceptions, the sheep display at its first five exhibitions came from other states —Missouri sheep were conspicuous by their absence.

In February, 1906, when our State Fair Board convened to arrange its premium list, it was requested to provide special classes for Missouri sheep as a means of inducing their exhibition but, owing to the opposition of two members, who contended that "the sheep industry in Missouri is old enough and strong enough to stand on its own bottom," the request was refused.

When the sixth exhibition by the State Fair opened September 30, 1906, there were 290 head of fine sheep on display and not a single Missouri sheep among them. Missouri sheep men to the number of a "baker's dozen" were rounded up on the grounds on October 2 and assembled in a small room in the Live Stock Pavilion where, with the counsel and encouragement of a few of the progressive visiting sheep men from other states, the Missouri Sheep Breeders' Association was organized. With this humble and unostentatious beginning the youngster started to grow—by January 9, 1907, when a special meeting was held in Columbia during the "Farmers' Week" conventions, its roster had increased to 60 members. At that meeting a resolution was adopted urging the State Fair Board to establish special classes for Missouri sheep at the 1907 exhibition, also one strongly endorsing the Brasfield bill for a dog law, then pending in the legislature, and appointed a legislative committee to aid in securing its enactment. The career of that measure is now history. Strong—not to say vindictive—opposition developed early in its consideration, but that opposition served an unintended good purpose. It aroused the sheep men of the State and aligned a large number of them with the State Association. At the end of a long-drawn-out fight the bill was forced to enactment but in so badly a multilated condition that its author and tireless champion could hardly recognize it. But we had grown within a short space of six months from the original 13 to 250 members, each an earnest and enthusiastic advocate of "more and better sheep for Missouri."

The force and influence of that motto have wrought marvels for the industry in this State. New flocks have been established in almost every county, scrubs have been replaced with grades and pure breds, and a well informed importer states that of the 3,000 breeding sheep imported into the United States from Europe during the past year, over 300 of them were purchased by Missourians.

Our State Association grew a pace, and by the opening date of the 7th State Fair, October 5th, numbered 335 members, and when the first annual meeting convened on the fair grounds, October 9th, our members had the satisfaction of knowing that the largest and best display of sheep in the history of the fair was on exhibition, among them being Missouri sheep good enough to win prizes in competition with imported animals from the crack flocks of Europe. Then during the afternoon of that same day, when America's record sheep sale was held in the sheep pavilion on the fair grounds, 140 head of sheep selling at auction at an average of over $50 per head, and every animal but four sold to a Missourian for spot cash, it dawned upon the members of this Association that organization of their kind *does organize,* does develop, advance and elevate an industry. That sale did other things—it not only regenerated America's wool map, but it caused the sheep men of the English speaking world to revise their estimate of Missouri. It was reported and commented upon by practically every agricultural paper in America. Without the existence of the organization of the Missouri Sheep Breeders it could not—and would not—have been held.

Such in brief is a conservative statement of the net results accomplished by this lusty infant now 15 months old, and with its membership roster nearing the 400 mark. But its work is only begun. There are yet about 1,800 Missouri sheep men not enrolled with it, and there is room and need for five million more sheep in Missouri to give us an average of 20 head per farm. So far as I have been able to ascertain there are now but three State Sheep Breeders' Associations having a larger enrolled membership than Missouri—those are Wyoming, Montana and New Mexico, each of which has had organizations for many years.

If there be truth in the maxim that "well begun is half done," our members can persevere with renewed courage determined to quadruple their membership, to make the quality of their sheep the equal of the world's best, and to ornament Missouri's hills and dales with added thousands of the "golden hoofs."

SHALL WE USE WESTERN EWES?

(J. W. Boles, Auxvasse, Mo.)

I would not advocate using any except the very best ewes. Whatever I handle or whatever principle I advocate I try to advocate something good. I will say there are conditions under which I think it is all right to use western ewes. One of those conditions is if they are the best that we can afford, use them, but do not use them too often. If we were to advocate using western ewes to advance sheep industry in the State of Missouri, we would just as well advocate using Texas cattle, or western cattle and western ponies, and Arkansas hogs, and all that sort of thing; or, we might just as well advocate cultivating inferior ground instead of good ground. We had just as well advocate using inferior implements to farm with, having inferior teams, and having inferior hands to work our lands, having inferior teachers to teach our children, and having inferior schools or any other thing of that kind. All these things it seems to me are along the same line. I hold that we may just as well feed a sheep that will produce a $10 lamb or a $5 lamb or a $15 lamb as one that will produce a $3½ lamb, or one that will produce twice as much wool as the other. Our land is too high to use cheap material. We cannot afford to use cheap labor, cheap teams, or cheap anything according to my way of thinking. Now, I am not saying that a man should never use western ewes. If a man has only $20 or $30 to put into sheep, and his farm will carry 12 sheep, then I think he can afford to buy a cheaper class of ewes; but if he can afford it, if he has the money and can afford to use a better grade of ewes, then I say use the best he can, and use them all the time. I have never seen anything too good for the farmer to use, provided he will take care of it. There is only one thing I will say in regard to buying the best. If you don't take care of them the cheap one will do you just as well as the best. But I do not believe in breeding common stock of any kind. I don't believe in inferior material of any kind.

I advocate using western ewes for one reason:

There are not one-third as many sheep in this State as there ought to be, and in order to have sheep on every farm where they should be, I would almost advocate any kind of sheep. Get the best grade of sheep you can afford, *but get sheep*. Then just as soon as we can we should grade up and get better sheep. We need more and better sheep worse than any other kind of live stock, because the sheep industry in this State has been greatly neglected, and there is not an industry—a live stock industry—in this State, except that of poultry, that pays a bigger profit than sheep. Of the live stock industries poultry comes first and sheep second; they come nearer paying 100 per cent than any other. To all these farmers who are not able to have the best sheep, I say get some kind of sheep. Let's have more sheep on our farms, because they pay.

DISCUSSION.

Mr. Carroll—If you did use a western ewe, how would you use it to the best advantage?

Mr. Boles—If I were to use a western ewe, or any other kind of a ewe, I would always use her with a pure bred sire. I would not breed to a grade sire of any kind. If I could not buy the best I would buy the best I could and would want him to be pure bred. I would not have a grade anything. I wouldn't have a grade *dog* if I was paid to keep him. I don't believe in grades.

Q. You made the statement a few minutes ago that you would advise a man, if he did not have more than $25, to invest in 12 ewes, to buy those 12 ewes at $25. Would you advise him to do that, or to borrow $25, making it $50, and buy 12 better ewes; or would you advocate the idea of staying out of debt entirely?

Mr. Boles—Well, no, if I did I would be advocating something I don't do myself. No, I don't mean for you not to go in debt; but if you think you can not afford to invest more than a small amount in sheep, buy what your farm will carry and carry right, and then breed up with a pure bred sire and keep the produce of that and continue to breed up.

Q. What kind of sheep do you favor?

Mr. Boles—In regard to the kind of sheep to breed, that depends on the individual. Some like one breed and some another. Some prefer the Merino, the fine wool sheep; others prefer a coarser wool. Some like the large sheep, others admire those of medium size. Breed the kind you fancy.

Prof. Mumford—Is it not a fact that we are keeping the sheep for the profit of them, and is it not a fact that by using the western ewes and raising early lambs from them we derive greater profit than in any other way?

Mr. Boles—I don't know. I take this ground about that: While a western ewe that will weigh 75 pounds will produce a good lamb, a ewe of better quality that will produce a better lamb is worth more and is no more expensive to care for than the cheaper ewe. I have never bred many western ewes. I don't have any desire to do so. I think they are fully as healthful as our native ewes. We can take them and keep them for one or probably two seasons, but this thing of using western ewes and selling off the produce and not breeding up, not grading up, I think is a detriment to the sheep industry of this State. It is not going in the right direction.

Q. Don't you think that the kind of sire we should use depends on what we are breeding for—whether wool or mutton?

Mr. Boles—Yes, of course, it depends on what a man wants. If you want a dairy cow you breed with that in view, and if you want a beef cow you breed with that in view, etc. And it is the same with the sheep.

Q. At what age would you commence breeding?

Mr. Boles—At one year of age. Never breed lambs. I don't think it is the best plan, especially for a man who has pure breds.

Q. What age sire do you begin with?

Mr. Boles—Begin with yearlings; and I don't advocate selling lambs and don't sell more than one or two a year myself. It is not satisfactory to the man who sells them. You have got to protect your business.

Q. I have an idea that it is well for a man, in buying his breeding stock, to buy the young ones and raise them up himself. Sometimes a disease gets among the stock he buys from, but if he raises them up himself he can keep them free from disease; whereas, if he buys an old one he might get the disease in his herd.

Mr. Boles—I think most of us make mistakes in breeding to too young a sire than to too old a sire. We very often get rid of the sires of our breeding stock just at the time when I think they are at their best.

Now, just a word in regard to selling our sires. We all know that if a man comes to our herd to buy a sire, the good looking one is the one he wants; and if you keep them in just medium condition you will never be successful as a pure bred breeder in selling your sires. The buyer wants him to look well.

Now in regard to *buying* these young sires. There are a great many men who will buy these lambs and turn them out on pasture and never feed them, and they go down and don't grow any, and next year some farmer comes along and wants to know where you got that little old scrubby lamb, and of course they don't want to buy any where it came from. So that is why I never sell lambs.

SESSION

Improved Live Stock Breeders' Association.

January 7-8-9, 1908.

PRESIDENT'S ANNUAL ADDRESS.

(R. W. Brown, Carrollton.)

It has truly been said that "Agriculture is the basis of all wealth," but as we look over the past and note how each step in the progress of agriculture has become more and more dependent upon live stock production, we may well say for the future that live stock improvement is the basis of all wealth. Upon it must be built that higher agriculture which in turn must be the foundation of every other line of industry. This fact is now generally recognized by all men, and there never was a time in the history of the world when greater interest was manifested toward improved live stock, than today by men of other callings than that of farming. The tendency to invest in live stock by these men is rapidly increasing.

What do we mean by improvement? Improvement by some breeders means only utility. Simply the dollars and cents side of the question, and we can but admit that this is the incentive that actuates improvement in all lines of industry. To prove that it has a dollars and cents value, we need only to refer to the great markets where the animals are sold on their merits alone. The quotations on all markets will average from two to three cents more per pound for well-bred cattle as compared with the scrub of the same age, and with this must be coupled the fact that it required a smaller amount of feed to produce a pound of gain on the well bred animal than it did on the common stuff. It is hard to understand how a farmer can fail to realize this fact and continue to hang on to the common stock, too often found on a great many of our farms.

There is no greater ambition in the world than to be of good to our fellow men. This ambition may be realized through the production of improved live stock, because upon this, depends the economical production of the very necessities of life.

The breeding and feeding of live stock has a refining influence over man, and develops within him the highest traits of character. In him you have a public spirited man, who is alive to better farms, better buildings, better roads, and better social conditions. No business or profession calls for such a wide knowledge of existing conditions for its successful management as does the management of an improved stock farm. To maintain or improve his flocks and herds a man has not only to deal with living organisms, which are subject to the most subtle influences in the world, but he must also have the highest ideals of symmetry in animal form. Many men are unable to grasp these great principles of animal improvement. An English writer once said that there were a hundred men in England fit to become prime-ministers where there is only one fit to breed short-horn cattle.

As to the future of live stock improvement, I see nothing in the horizon to hinder or make afraid. In our pure-bred record associations, we find that the volume of business each year is greater than the year before. We find also that the demand for pure-bred cattle is spreading over all sections of the country, and this demand will increase each year as the country grows older, and the fertility of the soil becomes more or less depleted. Last August while in Colorado, I attended a convention of the Colorado State Commercial Association in session at Greely, and had the pleasure of listening to a very interesting address on "Getting Stockmen for Colorado Farms." In his address the speaker made the statement that in every section of the state, even in the fertile, irrigated valleys, the great problem was: How to maintain fertility of the soil. This question of course brought out a storm of protests from the real estate men present, but it was verified by Dean Carlye of the Colorado Agriculture College, who was present at the time. Dean Caryle said that the address just delivered was the best he had ever heard on conditions in Colorado, and that the college had received a request from every irrigated section of the state to send them practical cattlemen. These conditions as applied to Colorado, can be applied to all sections of the country.

There is no state in the Union more favorably located for the economical production of all classes of farm animals than Missouri. The ranges and the markets are at her door. Her soil and climate provide for the maximum production of all kinds of grain and forage. Her pure-bred live stock have long since won for her fame and distinction, and I predict for her through the excellent work of this Association a continued preiminence. We are here for an inter change of thoughts and ideas. Let this inter change be free, and without stint. By coming here you have expressed an unselfish interest that can do naught but work for live stock improvement in our State. This is a day of organization, and co-operation. One hundred men working together for a common cause can accomplish much more than can one hundred men working separately for the same purpose.. Through the instrumentality of this organization must come the appropriations necessary for the promotion of agriculture in this State, and through it must be placed on our statute books, intelligent laws for the protection of our industry. The out-look is bright, and remember you are on a solid foundation, and while there may be ups and downs, if we carry on the work with an earnest purpose and in the light of the knowledge that is at hand, we shall be on the high road to success.

BEEF PRODUCTION ON HIGH PRICED LAND.

THE PLACE OF BEEF CATTLE PRODUCTION AMONG THE PERMANENT INDUSTRIES OF THE CORN BELT.

(By H. J. Waters, Dean Missouri College of Agriculture and Director of the Experiment Station.)

It may be accepted as final that the permanently prosperous systems of farming in Missouri and elsewhere must be based on animal husbandry, and must involve the feeding on the farm of the principal products of the land and the returning to the soil of the largest possible proportion of the elements of fertility which the plant takes from the soil in growing.

Thus it is not a question as to whether live stock shall be grown extensively or not, but rather what particular kind of stock, or what special phase of live stock farming will prove most profitable and enduring.

It is true that hogs and sheep possess important advantages over beef cattle, particularly with respect to the cheapness of production and a somewhat higher average price at which the live animal sells when fitted for the market. On the other hand, cattle possess certain very marked advantages over all other classes of live stock, such as comparative freedom from parasites, contagious diseases, injury from other animals, and the ability to convert large quantities of coarse and otherwise unmarketable material into food of very high value to mankind.

Fig. 1. Cattle of this breeding can be made fat at almost any age. Yearlings used by the Experiment Station in feeding trials.

These facts become more and more important as the country becomes more densely populated and the diseases and parasites on our farms naturally increase in prevalence and extent of injury, and especially do they become more important when the necessity for manufacturing meat out of cheap and mainly coarse material grows larger.

The practice so common now, particularly in the corn belt, of converting large quantities of palatable and concentrated material like corn into meat products cannot long endure. This corn will sooner or later become so valuable for human food that it cannot be profitably converted into meats, and our animal products must then be manufactured chiefly from the coarse waste materials of the farm and the by-products of our factories.

It is perfectly obvious, therefore, that cattle utilized wholly or mainly for the production of beef must continue to be an important phase of our agricultural industry for an indefinite time.

If, therefore, this class of farm animals does not yield so large a profit as other kinds of animals on our high priced land and in the present state of the labor market, the situation is to be met by improving our methods of producing them rather than by going out of the business.

BETTER ANIMALS THE FIRST STEP TO TAKE.

In no other direction can more be immediately done and with such slight expense to meet this situation and to increase the profits to be derived from cattle than by making a marked improvement in the quality of the animals themselves.

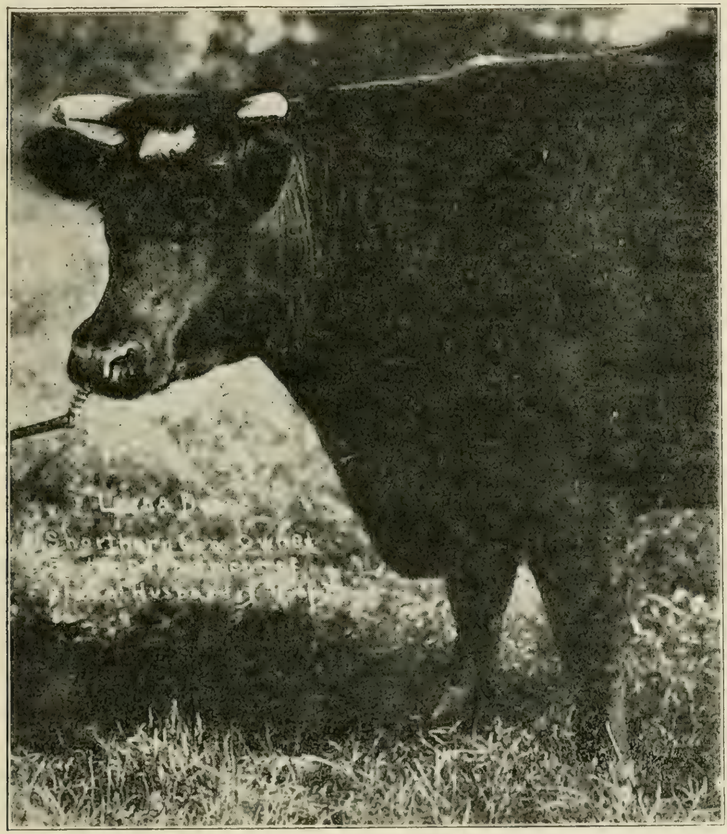

Fig. 2. The type of mother from which profitable calves must come. Shorthorn cow owned by the Missouri Agricultural College.

Some fifteen or twenty years ago, when dairying was really beginning to be put upon a rational basis as an important agricultural industry, the first and most important step then taken was the elimination from the successful dairy farms of every cow that failed to produce enough milk and butter to pay a profit. A sort of minimum of production for profit was established, and all failing to come up to this mark, so to speak, were consigned to the butcher. At first this dead-line was fixed at a very conservative point, viz., about 200 pounds of butter in a year, so as not to have so large a proportion of the average herd fall behind as to be discouraging to the owner. Later this amount was gradually raised, until now in the very best dairy herds 350 or 375, and in rare cases 400 pounds of butter per year would be regarded as the minimum production of a cow that is entitled to a permanent place.

Precisely the same principle must be applied to the beef herds on the high priced land of our corn belt, if this industry is to continue to hold its own in competition with pork and mutton, and horse and mule, and dairy production. Thus, every cow failing to produce a calf worth $20.00 in the fall and in addition, after the calf is weaned, to produce enough milk and butter to pay for her feed and the labor involved, up to within a reasonable time of calving, should be sold for immediate slaughter as unfit for a herd cow. Applying the dairy herdsman's method still further, this minimum price for a steer calf at weaning time should be rapidly raised above $20.00, or the amount of milk and butter the cow is required to produce should be rapidly increased.

In this connection it may be well to say that it is out of the question to expect very high development of the beef qualities at the same time that very high dairy qualities are developed. These two qualities are apparently antagonistic one to the other, and this antagonism manifests itself very markedly when an attempt is made to carry them both along to a high degree of development. In other words, beyond a very reasonable degree of development, the two have not yet been carried together in one and the same animal. If a very high development of the beef qualities of the animals is sought, it must be expected that the dairy qualities must be somewhat subordinated.

Conversely, if the dairy qualities are to be sharply intensified, it is unreasonable to expect the calves to have more than mediocre beef quality. We hear much about the dual purpose cow, which in general is a mediocre beef cow and a fairly good milker, or a mediocre milk cow and a moderate beef animal.

Nevertheless, the average cow of the corn belt now kept chiefly for the production of beef calves is so mediocre a beef animal that she ought really to be a high class dairy cow at the same time. Or this same average cow is a poor enough milker so that she ought to produce a beef calf worth practically twice as much as it is without having her milking qualities affected in the slightest by this relatively high development of the beef qualities. In short, this cow has neither the beef nor the dairy quality very highly developed, and she will stand to have her capacity in one or the other of these directions practically doubled without affecting adversely her present capacity in the other direction. A cow may be excused for lack of high beef qualities if she possess superior dairy qualities. Or, we may overlook a reasonable deficiency in her capacity to give milk or produce butter if she have the form of a beef animal to a very marked degree, and if her calves possess the qualities required to top the market. But a cow poor in both of these directions has nothing to commend her and does not deserve a place on our farms.

The first step would be to eliminate perhaps one-third of the poorest cows, and to eliminate perhaps a large majority of the bulls now in use, and to establish the fixed policy of using as sires none but registered animals of one of the standard beef breeds, such as the Shorthorn, the Angus, the Hereford, or the Galloway, and to stick to one breed rather than to follow the haphazard and miscellaneous crossing that is now so common.

The day has long since passed when any man can afford to use an unregistered sire of any class of farm animals. Not only should the sire be registered, but it should have a good pedigree and should be withal a good individual. This means that to head our grade herds even something better than the culls from our pure bred herds are required. The cattle raiser must be willing to pay for real quality in his sire. The truth is, the culls from these pure bred herds should be slaughtered for butcher stuff instead of being allowed to perpetuate their deficiencies and weaknesses.

A really good pure bred sire is indispensable to success and profit in raising grade cattle, just as it is in raising registered animals. This point cannot be too strongly emphasized.

In short, let the farmer make a systematic effort toward the improvement of his herd, and in five years' time his steer calves will bring an average of $25.00 per head, where they now bring an average of less than $15.00. As stated before, there is no one step that is so important to make, and that is so fundamental to the whole beef industry as this one. Upon it depends the entire subsequent profits of the handling of cattle. From such herds would be bred steers worth on the market, 6 cents or 8 cents a pound, in comparison with the average of 4 cents or 5 cents a pound for the plainer sorts.

It is self-evident that it costs no more to make this high class beef than it does the cheaper sort. If a manufacturer had the choice of making out of the material he was using a grade of shoes, for example, worth $4.00 per pair instead of $2.50 without additional labor or other increase in cost, and requiring only a little closer and more intelligent attention to the finer details of the business, is it not to be supposed that he would make his material into the better grade of shoe? The cases are fairly parallel, and it is our duty to convert our feed and labor into the most valuable and highest priced material possible.

AFTER THE CALF IS BORN.

The calf is born with certain tendencies which cannot, so far as we know now, be materially changed, and must be accepted for better or for worse. These relate, among other things, to the size the animal will attain when fully mature, if nourished in the ordinary manner; the length of time required for it to mature; the form it will have when finished; the predisposition either to grow rapidly and not fatten until late, or to fatten at almost any stage of its existence that a sufficient amount of food is given to supply the requirements of maintenance, growth, and fat.

These factors affect vitally the whole financial outcome and are, so far as we now know, controlled by the breeder rather than influenced by the feeder. After the animal is born, therefore, it is practically beyond control in these respects, and it is of the utmost importance that the feeder adapt his methods of feeding and handling to the peculiarities of form, temperament, early maturity, size, quality, etc., of the individuals with which he has to deal. To take an animal for baby beef, for example, that has a tendency to grow rapidly and mature late, would be just as short-sighted as to keep until it is three years old before being put into the feed lot, an animal that has the tendencies toward early maturity very strongly marked, and that is naturally under size, over refined, and wholly unfitted to subsist on the rough feed of the stalk field and straw stack. To take a miscellaneous collection of steers representing all gradations between these two extremes and give them the same treatment and endeavor to finish them at the same time and in the same manner, would be equally wasteful of feed and labor. To state the general proposition differently, to attempt to market an animal at 900 pounds that was designed by its breeding to be finished at 1,500 pounds, or to attempt to make a 1,500 pound steer out of an animal that reaches its highest development at 1,000 pounds, is committing a deliberate and palpable blunder.

In order to economize in labor, it is necessary, of course, to handle all the steers in a given bunch essentially alike, which means that a certain amount of culling is required in order that all that are to be kept shall belong to the same class and respond profitably to the same treatment. Then it is only required that the treatment given be that which is best adapted to the type of animals involved.

To breed steers of uniform type and tendencies, so that they will not require heavy culling at weaning time or the following spring, is one of the most difficult undertakings of the cattle raiser. The beginner should not, however, be discouraged. Men have succeeded to a marked degree in this direction, but it has taken many years of patient work and watching, and a liberal use of good blood.

TWO PRINCIPAL CLASSES OF CATTLE RAISERS.

The men who are breeding and raising cattle for beef in Missouri may be divided into two principal classes, each requiring for the best results radically different methods of procedure. The one class is on the better corn land of the State, and the other on land not so well adapted to corn, but primarily adapted to pasture purposes. The men of the first class must rely upon full feeding operations for their principal profits, while the other must get through the winter as cheaply as possible and rely upon gains made at pasture as the chief source of income.

I. Raising Beef on High Priced Land.

The first class represents the man on productive and high priced land, with only a limited area of rough, untillable land for pasture. Whatever pasture he has, therefore, is on land that is well adapted to the growing of other crops. This class is by far the more important in point of numbers and aggregate investment in Missouri.

Such men, as a rule, are long on corn and winter forage, and generally limit their grazing area and facilities for summering stock to the needs of their breeding herds and work stock. They must, therefore, depend upon winter feeding for their main profits. They have more forage and grain than would be required to merely carry through the winter in stocker condition the animals they can graze through the summer. It is true they might increase their pasture area and cut down correspondingly their corn and forage crop areas, but, broadly speaking, this sort of land is more profitably grown in some hay or grain crop than run to pasture. In other words, this land is too valuable to be used extensively for pasture. Or, stated differently, pasture crops do not, as a rule, produce enough forage to pay a reasonable return on this sort of land.

By pursuing a systematic crop rotation in which the hay crops are wholly or almost exclusively legumes, such as red clover, cowpeas and alfalfa, and by being particular not to run the land in corn or small grains too frequently, and especially by being careful to feed all the corn and forage on the farm instead of selling a part of it each year, and by carefully saving and applying with a manure spreader all of the manure produced, the productiveness of this class of land may be kept up without laying down large areas to permanent pasture.

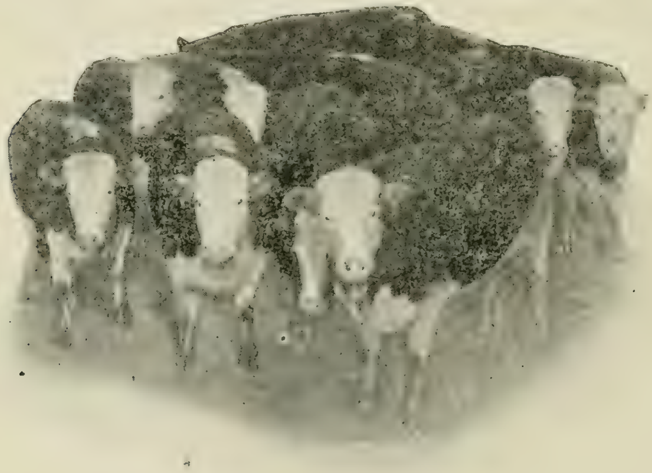

Fig. 3. A profitable type of early-maturing cattle.

On lands not of the very strongest type this system of farming may be slightly modified, by giving especial attention to the production of legume hays and buying onto the farm a portion at least of the corn to be fed with these hays. On a still lighter class of soils this latter plan might be modified still further, by making a part of the grain purchased some concentrate rich in nitrogen and phosphorus, like cottonseed meal or linseed meal.

It goes without saying that crops that exhaust the soil and possess at the same time a comparatively low feeding value, like timothy, millet and sorghum, would have no place in this system of farming or feeding. They deserve a very small and unimportant place in any system of farming that is adapted to Missouri conditions.

Baby Beef—For this class of men there can be no argument concerning the advantages of pushing the animals along as rapidly as possible and marketing them as baby beef. It is from the standpoint of this man, and not from the view-point of the professional feeder who buys his animals when they are ready to put in the feed yard, that this matter will be briefly considered. It was clearly pointed out in a previous annual report of the Board of Agriculture* that these professional feeders prefer animals of reasonable maturity because they fatten more rapidly, more uniformly, more certainly, and require somewhat less attention to the niceties of feeding. These men, in buying feeders, are indifferent to the question as to what they may have cost the man to raise them, so long as they may buy them ready to be put in the feed pen, dehorned, vaccinated against blackleg, etc., with sufficient margin to fully or practically offset the additional cost in the gains required to be made in fitting them for market.

The attitude of this professional feeder toward the matter of baby beef is not a safe guide for the raiser of cattle and should really not influence in the slightest his practice. The two men sustain a radically different relation to the problem, and each should be controlled by his own set of conditions. The one thing which has contributed more than any other to the haziness and confusion of the whole matter has been our failure to define sharply this difference. One in buying his feeders can overcome the handicap age imposes upon the cost of gains, but the raiser of cattle has no such recourse and must squarely face the issue of paying for every day the animal lives, whether it gain, stand still, or lose in weight.

Obviously the man who raises cattle on high priced land should feed them out as baby beef, and would have occasion to raise and feed in the same connection a large number of hogs, the legume area being especially adapted to the growing and finishing of hogs with a minimum loss from disease and with a maximum profit.

For a man so situated to try to keep his steers over to be grazed the second summer as yearlings, and especially to hold them through the second winter merely for the opportunity to full feed them on grass as two-year olds, would be wasteful of feed and opportunity.

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*For an extended discussion of the baby beef proposition from the standpoint of the professional feeder, as distinguished from the cattle raiser, see an article by the writer entitled "Limitations of Baby Beef Production," 39th Annual Report of the Missouri State Board of Agriculture, pp. 114-166. Also bulletin 76, Missouri Experiment Station, p. 29. Also a bulletin of the Missouri Experiment Station soon to be published, by Professor F. B. Mumford, reporting in detail the results of eight years of careful feeding experiments with cattle of different ages at this station.

The animals should be on full feed before the weaning process begins, so as to prevent the heavy shrinkage that it usually entails. Following this should come vaccination against blackleg, and dehorning.

The full feeding should continue until early the following June or July when, if the cattle are bred right, they will be as fat as they can be profitably made under ordinary states of the market, and will weigh from 950 to 1,050 pounds, and will have paid for their feed and raising and left a good profit.

Cattle of this weight, when of good quality and carrying a reasonable finish, are never over-supplied on the market, and bring, especially at that time of year, as good a price as any class of cattle sold.*

It goes without saying that steers to be profitably handled in this way must be well bred, uniform in type and quality, and must be capable of making rapid gains, of fattening early and finishing up smoothly.

For a general discussion of the feeds to use and general methods of handling the cattle, the reader is referred to the second part of this paper, which deals especially with these problems.

II. Raising Beef on Thinner Soil.

The second class of farmers is composed of men whose land is better adapted to grazing than to grain growing, and is too rough, too much inclined to wash, or too thin to be successfully and profitable grown in corn, except at intervals. Such a man is long on pasture and short on grain and, as has been stated before, must look to the grazing period for his profits, and must plan to get his cattle through the winter at the minimum expense and in a moderately fleshed condition, in order that they may graze most profitably.

It is true a man so situated might grow an excess of clover and cowpea hay for the benefit it would be to his land as well as for its value in growing stock, and then buy extra corn and feed his calves out the following summer on grass, precisely as described for the first class of farmers. If he be located convenient to a large, regular and cheap corn supply, there is no reason why this practice would not be as profitable in one case as in the other, and the farmer on thin land would have even more reason than the one on the stronger land for adopting this practice, since he stands in greater need of the plant food which would be acquired without cost in the purchased feeds. In no other way can the fertility and productiveness of land be built up so rapidly and so cheaply, except, perhaps, by feeding dairy cows, which would, on account of the higher priced product obtained, justify the purchase of larger quantities of feed rich in nitrogen and phosphorus, such as cottonseed meal, linseed meal, etc.

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*For a full discussion of the influence of the season of the year, weight, quality and fatness upon the selling price of cattle on the market, see Missouri Experiment Station Bulletin No. 76, pp. 42-51.

In general, however, the farmer on the thinner grazing land will not have such a corn supply available at a price that will enable him to feed this class of stock, and his only recourse would be to make his money out of the cheap gains made on grass. This means that he should carefully save all of his corn stover and feed it with his clover or cowpea hay and a limited amount of corn to his calves through the first winter.

The question as to whether it is best to sell as calves or carry them through the first winter and sell as yearlings at grass—in short, the whole question as to when to sell, can only be answered by the individual himself, because he alone is in possession of all the facts with respect to supply of feed, etc.

If they are to be sold as calves, they should be carried up to the selling point in a strong, vigorous condition, and be offered with the milk bloom on. At no other time in the life of a steer does it look so attractive and promising—not even when finally fattened for slaughter. But if to be wintered, they should be weaned while the grass is yet good, so that growth may be not checked, or if the grass be short, they should be taught to eat and be fed liberally with some good forage, like bright clover hay, and a limited amount of grain through this weaning process. The dehorning and vaccinating against blackleg should immediately follow.

Calves Should be Well Wintered—It is especially important that such cattle be made to grow well the first winter, which means that they should be fed liberally. The rate of growth at this period of their life is normally much more rapid in proportion to the weight than later. Therefore, to restrict the growth process at this stage of the animal's life, may affect the size of the animal and it certainly will increase the cost of growing it to a normal size. The fact that they are to be grazed the following summer rather than fattened renders it imperative that they be not so heavily fed as to carry to grass any considerable amount of fat. It is the poorest possible policy to lay fat on animals in the winter at a large expense, to be lost the following summer at pasture.* This is reversing the almost universal practice of successful farmers. Gains are made very much cheaper in summer than in winter. Whenever possible, fat should be stored in summer to assist in cutting down the expense of the wintering process. It is the part of good management, therefore, to have an abundant supply of grass, so that all the fat possible may be made in summer at pasture, to be used the following winter in helping to carry the stock through in case of a shortage in the winter forage.

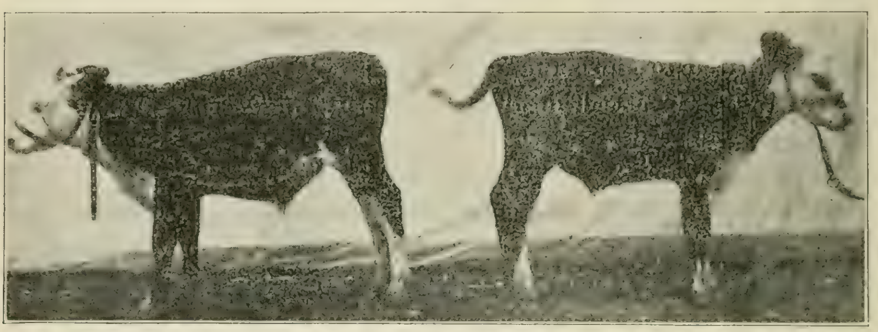

Fig. 4. Calves of excellent breeding that have been underfed.

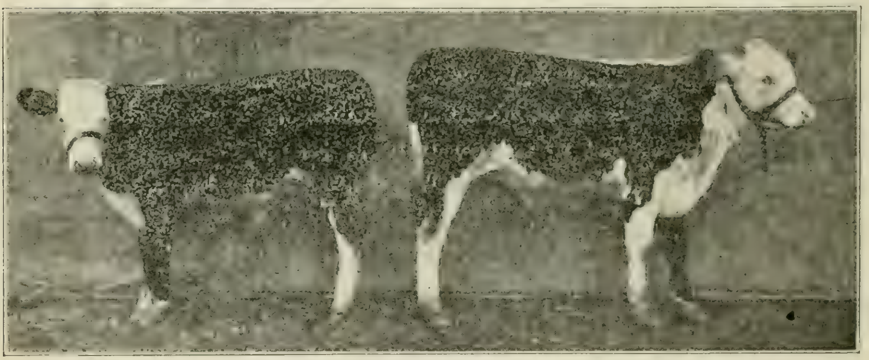

Fig. 5. Calves that have been well-bred and well-fed.

Fat Not Necessarily Wasted when Animals are Permitted to Get Thin—It is a very old, and in general, a good maxim, to "never lose the calf fat." This is the same as saying an animal should never be allowed to get thin, or should never be allowed to lose its stored fat. Certain circumstances, however, that compel an animal to use this fat need not in the strictest sense compel it to lose it, notwithstanding the fact that the animal has disposed of it and is thin. It might be likened to a man with money deposited in a bank. He sees an opportunity to use this money to good advantage, and withdraws it from the vaults of the bank, and in one sense spends it, but really invests it, or exchanges it for another form of wealth which he considers to be more valuable or useful to him. The results of some experiments* now in progress at the Missouri Experiment Station strongly indicate that fat in young and growing animals may be used to support the growth process if necessary. It is not to be believed that fat may contribute directly to the growth of the animal, that is, to the increase in size and weight of the muscular tissue, skeleton, hide, etc., but when such an animal is on a limited ration it is entirely possible that the stored fat of the body may be used to supply a portion at least of the animal heat and the energy required in the ordinary activities of the animal, thus protecting the proteids in the food so that they may be used by the animal for making growth. If the animal had no stored fat to use for the protection of the proteids in the feed, or if this fat resorping process, so to speak, could not go on in the animal organism, these proteids would need to be burned to supply fuel for the organism instead of being manufactured into muscle and skin and other body tissue.

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*For a full discussion of this point, see Missouri Experiment Station Bulletin No. 75, on Wintering Yearling Cattle, pp. 46-53.

The outcome of it all seems to be, therefore, that it is possible to lay on fat in summer cheaply and to draw upon this reserve in winter to such an extent that the amount of feed required to carry the animal through the winter is reduced without seriously interfering with the rate of growth. Precisely this has taken place on the ranges since animals first inhabited this area, and this is what occurs on our best farms, even when young animals are fed moderately in winter following a period of liberal nourishment at pasture.

We are perfectly familiar with the phenomenon of young and rapidly growing animals going out to grass in the spring somewhat heavier than when they came into winter quarters the fall before, but thinner, i. e., carrying less fat than they did in the fall, but taller, and materially larger. In general, to carry such animals through the winter without the loss of any of the fat, would require a heavier and richer ration than is ordinarly given to this class of stock, even on our best farms. It is obvious, therefore, that fat that is so used is neither lost nor wasted, but is rather exchanged for growth which at the time is deemed to be of more importance to the owner of the animal than the fat.

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*Results not yet published.

As referred to elsewhere, to reverse this process with respect to the seasons of the year, and store fat in the winter with expensive grains to be used in the summer to help the animal grow, is using fat that has been manufactured at the highest possible cost to make a product which at this season of the year is cheap to make and of relatively low value.

It is not to be understood from this that too much reliance should be placed on the fat stored in summer for supporting the growth process in winter. In truth, except in seasons of very scarce and high-priced winter forage, it would be safer to attempt to hold enough of the summer fat to keep the animal thrifty and vigorous and support the growth process in winter mainly by the feed then supplied. To make this matter clearer, it may be stated that whenever the body weight of the animal is held stationary, i. e., without gain or loss, and the animal continues to grow taller and larger but thinner, which in the case of young animals always happens, the fat is being used to support growth in accordance with the manner outlined above. When the animal declines in weight the fat is being used wastefully by being burned up to supply the ordinary maintenance requirements of the animal, and in ordinary practice this use of fat is wholly unjustifiable. When the animal is made to gain rapidly enough to prevent it from getting thinner it is reasonable to suppose that sufficient food is being given to supply the insistent demands of the growth process, and under these circumstances it is assumed that no previously stored fat is being resorbed.

Maintain the Maximum Rate of Growth—It should be kept constantly in mind that it is growth that is now sought to be produced in these animals. A steer uses its feed for three separate and distinct purposes, viz.: Maintenance; production of growth; production of fat.

It has already been pointed out that the nourishing of these animals on such a plane in winter as to cause them to store up much fat when they are to be grazed the following summer is inadvisable. It is nevertheless very important that the highest rate of gain be maintained that is possible, without laying on a considerable amount of fat. It is not known exactly how far the growth process may be promoted without causing the storing of fat as well. That is, we do not yet know what the upper limit of growth is before the animal begins to deposit fat. Nor do we know how much this falls short of the maximum rate of growth of which the animal is capable. Clearly this would vary greatly with different individuals, and likewise with the same individual at different periods in its life and in different conditions of flesh. Occasionally we find an animal with the tendency to fatten so marked that it is impossible to maintain a very moderate rate of growth without the deposit of fat occurring at the same time. In other words, the two processes, in this animal at least, are in a sense, inseparable. The other extreme is the very vigorous, growthy, late-maturing animal that will when young, and frequently up to the age of eighteen months, eat to the full limit of its appetite of a concentrated and palatable ration and will gain perhaps as much as two pounds a day for a considerable length of time without showing any material deposition of fat. In this case the upper limit of the growth process is reached in the early life of the animal, at least, without, at the same time, having it overlap the fattening process.

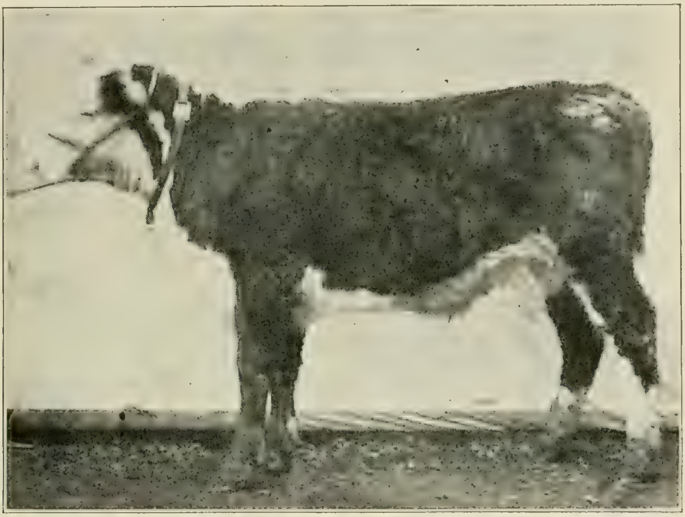

Fig. 6. The sort of steer that will grow slowly and fatten easily. Such animals have the early maturing quality so highly developed that they lack in thrift and size.

Between these two extremes stands the average animal as at present developed, which will maintain in its younger life, or say within the first year or year and a half of its life, a rate of growth that will be considerably under the maximum gain in live weight, of which the animal is capable. To feed this animal, then, all it will eat of an ordinary grain ration would require that a considerable portion of the feed consumed be not manufactured into new growth tissue, but be merely stored on the body as fat.

The cattle man, however, is only interested in the general proposition that there is an upper limit of growth without the storing up of any appreciable amount of fat. It is believed that cattle that are to be handled as stockers should be kept in winter as near this point as possible. In summer all the gain that is possible on grass alone is acceptable. Anything short of this will unduly prolong the growing period and at the same time increase unnecessarily the cost.

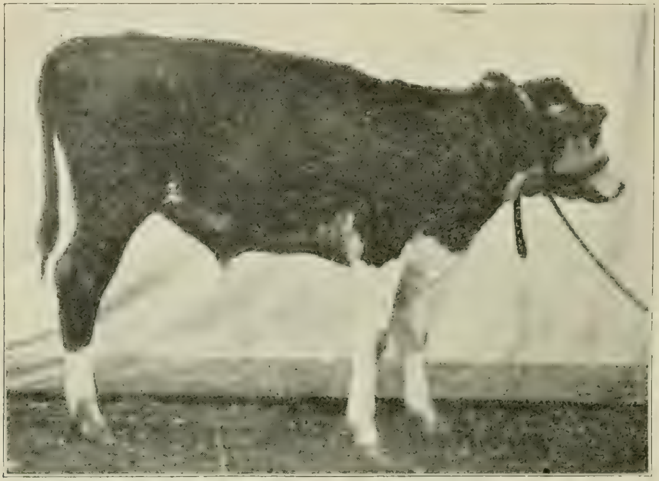

Fig. 7. The growthy and thrifty type. Matures slowly and makes a large steer. Fattens slowly while young.

Maintain Good Pastures in Summer—Too much emphasis cannot, therefore, be laid on the fact that in this system of cattle growing the profits come from the gains made on grass in summer, and from marketing to good advantage the coarse, rough material, such as corn stover, straw, etc., and the feeding of the legume hays on the farm so as to maintain the fertility. To so overstock the pastures that the cattle will fail to make profitable gains in summer, and consequently go into winter quarters thin, weak, and dwarfed in size is to virtually throw away the entire profit of the enterprise. Or to make good gains in the early part of the summer on the flush of grass and to permit this to be lost through short grass, inadequate water facilities, etc., during the hot, dry months of July and August and early September, is equally wasteful.

Besides, to make cattle of good quality, such as we must now produce to pay a profit, means a uniform and liberal nourishment from birth to maturity.

FEED AND CARE DURING THE FIRST WINTER.

Under this system the chief part of the ration of our cattle must be roughage, but calves from weaning time until grass, deserve, and will pay a profit on, a more liberal ration. At this age they are less capable of utilizing fodders of low palatability and nutritive value than later in life and less than the breeding stock of the farm. This means that a considerable part of the roughage for the calves the first winter must be legume hay, but with the supply of corn fodder on the ordinary farm it is not necessary or even advisable to make clover or cowpeas the sole roughage. Something like one-third of the daily roughage consumption should be of field cured corn stover. When wheat or oat straw is available it is a good plan to let them have the run of the strawstack. Then feed them liberally on bright, well cured clover or cowpea hay. If the pea hay should contain very much grain, the amount offered would, of course, be correspondingly less. Ordinarily the rest of the ration should be corn. Perhaps the best form in which this can be fed is shelled. If facilities are already provided, and it is not too costly this corn may be crushed, cob and all, to good advantage. It should never be fed as corn meal, i. e., shelled corn finely ground, without mixing it with ground oats or bran. These two latter feeds, however, are entirely too expensive to be used for this purpose. The calves will often learn to do their own shelling, and in such cases ear corn is most satisfactory. The amount of grain to give will vary with the season of the year and the weather, but in general, three pounds per head in the fall and about four pounds per head during the worst weather of winter and early spring will be found to be about right. Instead, however, of feeding a fixed amount, it is best to be governed wholly by how the animals do. If they are thirfty and vigorous and yet not showing a disposition to fatten, it is certain that they are being fed approximately to the profitable limit. The moment they begin to show a disposition to fatten, the feed should be slightly reduced. If, on the other hand, while still growing they show a tendency to get thin, and the coat shows an unthrifty condition, the amount of legume hay or grain should be increased.

Winter Pasture—In earlier times, when land was more abundant and much cheaper than now, it was a very common and well approved practice to save a considerable area of blue grass to be grazed during the winter. So long as this pasture remained good, cattle required no additional feeding, except during extreme weather. In general, however, this is not an economical practice, because the amount of grass produced when allowed to grow without being cropped during the summer is less than when grazed. This is essentially an attempt to make hay out of blue grass, minus the expense and labor of harvesting, curing and feeding it. Moreover in many seasons a large part of the summer growth is seriously injured by rains and freezes, and only the lower stratum which is well protected, remains unweathered and palatable. With the present high price of land and the necessity for getting the maximum crop from each acre each year, this practice will become less and less common. It should not be understood, however, that the pasture may not be so managed as to be strong at the close of the growing season, but in general it will be found best to have it eaten off reasonably close by the time real winter weather sets in. This, therefore, involves the taking care of the cattle from the early winter to the time grass comes again in the spring.

The sowing of wheat or rye for winter pasture, especially for calves, has something to commend it, but its value is in many cases somewhat overestimated. Where wheat is grown for the grain and is on strong enough land to stand pasturing without materially injuring the crop, and will at the same time produce pasturage enough to be of real worth to the cattle, it is worth considering. But to sow rye or wheat specially for pasture on land that is not particularly adapted to either of these crops, and therefore, get sparse growth and one which will give the cattle only a taste of green succulent food, and therefore a distaste for dry and comparatively unpalatable feed like field-cured corn stover, will be making winter pasture harmful rather than helpful.

It is a common notion that rye is a hardier and stronger growing and altogether more productive plant than wheat, and is most generally recommended for this purpose. According to the writer's experience, however, wheat for fall and winter grazing is quite the equal of rye and has the advantage of keeping the farm free from rye, which is a very important matter when wheat is to be grown for the grain. Besides rye seed is usually difficult to get. It is true that rye comes along somewhat faster in the spring after vegetation in general starts, but this is a time of year when there is less pressing need for green feed than earlier.

In general, cattle on wheat fields or winter rye pasture will require closer watching than when handled in any other way, because they are likely to become very thin and exceedingly weak before the owner realizes it, and will require careful nursing and heavy feeding to bring them back to strength and vigor again. The length of time required for a bunch of thin, weak wheat field calves to get well started to gaining, either when grazed or full fed, must have impressed itself upon every cattle man who has had experience with them. All this is intended to be a word of caution against relying too largely upon this class of winter feed rather than to discourage a reasonable use of it.

Of course, there is always considerable winter pasture in the stalk fields in addition to the stalks themselves. The grass that has grown during the summer along the fences, in the uncultivated waterways, etc., cannot be utilized in any other way to advantage than by running the cattle in the field after the corn is removed.

We are gradually approaching a system of agriculture, however, which will not have stalk fields for the cattle to run on in winter. The corn fodder will be field cured and fed to the stock direct, or preserved in a silo. For the present, however, we are producing more fodder on many farms than it would be profitable to utilize in this way, and the stalk field is the inevitable result and must be utilized essentially as it is now. The mistake is very common, however, of relying too much or too long upon the stalk field, i. e., of requiring the animals to eat it out too closely before they are given anything else. Such practice almost invariably involves a shrinkage in weight. It goes without saying that any shrinkage in weight is, under ordinary circumstances, unjustifiable.

WINTER SHELTER.

The practice of the farmers of the corn belt has been open to some criticism along this line, but he has not blundered so seriously as one not wholly familiar with all the facts might suppose. At any rate, it is not necessary to begin the cattle business in a rational way to build expensive barns. In the latitude of Missouri, the cattle will be well off with free access to a shed open to the south, wholly closed on the north, and with a windbreak on the east and west. The shed should be so located as to insure good drainage and should be deep enough to permit the animals to keep out of the storm when it comes from the south, but not so deep as to not be almost entirely flooded with sunshine when the weather is clear. It is of the utmost importance that the ground under the shed be kept dry. Under ordinary circumstances, however, cattle should not be compelled to remain under the shed either by confining them there or by having the lots so small, and therefore so muddy that there is no other reasonably comfortable place for them. During a severe storm it will of course be advisable to confine them to prevent the weaker ones from being forced to remain outside, but in general, sunlight and fresh air, with an opportunity to get away from the odors of the barn or shed and find a sunny slope protected from the wind, will go a long way toward keeping the appetite whetted to the utmost and keeping the cattle in the most thrifty condition possible. In ordinary weather the cattle themselves are the best judges of when they should repair to the barn or shed and when to remain outside.

It goes without saying that young animals require more shelter than older ones, other things being equal. It is more strikingly true that poorly nourished animals require more protection from cold than do those that are well nourished. The truth is that the confining of cattle in a warm barn when they are on full feed is detrimental to their rate of gain and to the economy with which they will gain.* To expose thin and poorly nourished animals to cold and storms is exceedingly unprofitable as well as cruel.

The comparatively small cost of suitable sheds makes it entirely feasible to build more than one on the farm and to make the prime consideration of their location the convenience to the feed. At best it is both troublesome and expensive to handle coarse fodder. The nearer, therefore, the animals are to this supply, the more convenient and in all respects the more satisfactory it is. A practice all too common is the confining of stock in muddy lots near the house all winter and hauling in all of the feed from even the most remote parts of the farm, then being at the expense of hauling the manure back. This is an awkward and expensive arrangement that may be corrected at comparatively little expense, by building one or more additional sheds.

The proper preservation of the manure and the convenience with which it may be handled and applied to the parts of the farm needing it, must have full consideration in the location and arrangement of sheds, feed lots and yards.

The Silo on the Beef Farm—One of the most common and yet fundamental errors is the assumption that the silo is profitable only to the dairy farmer. The truth is, the silo is quite as important for the beef man. Particularly is this true of the man who is wintering cattle in accordance with system here outlined.

With silage, the grain may be omitted, the corn silage, if properly made containing enough grain. What we have found to be an exceedingly profitable ration is corn silage and a legume hay and so much field cured corn stover or wheat straw as the animal will relish for a change. Good thrifty calves of the beef type should be given about 12 to 16 pounds of silage and nearly all the clover or cowpea hay that they will eat, with access to bright clean corn stover or a straw stack.

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*For the results of experiments bearing on this point, see Missouri Experiment Station Bulletin No. 76, pp. 54-61.

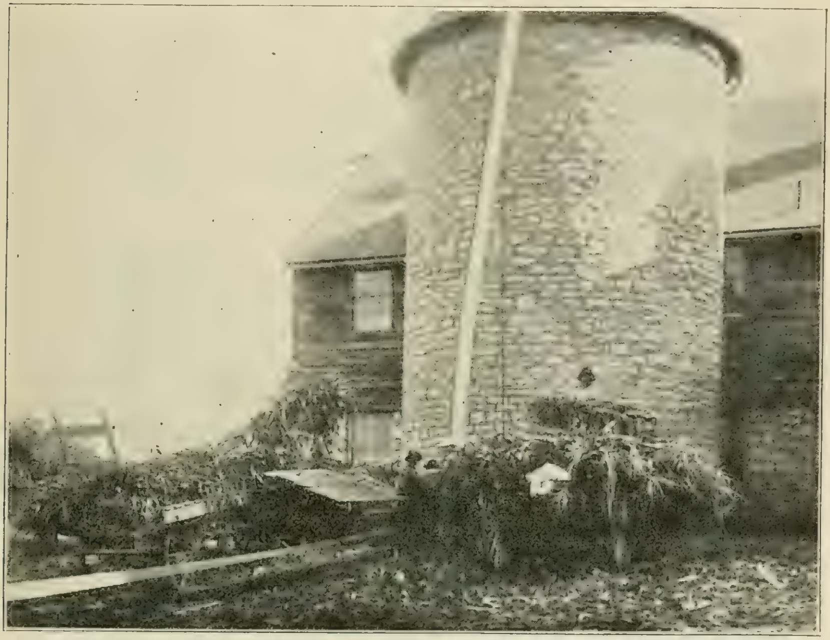

Fig. 8. Making silage at the Agricultural College with which to winter the beef herds.

FEED AND CARE DURING THE SECOND WINTER.

The winter care of cattle becomes simpler as the animals grow older and as their capacity to utilize coarse material of low palatability increases. Then the rate of growth in the second winter is not so rapid as in the first in proportion to the size of the animal, or in proportion to the ability of the animal to eat. Moreover, it is perhaps not so vital to the general outcome that the upper limit of the capacity to grow be reached in this second winter as it was in the first. Nevertheless, well bred yearlings will respond profitably to a system of feeding that is liberal enough to maintain good gains, and yet these gains will not seriously interfere with their capacity to gain at pasture the following summer.

If these animals are to be grazed as two-year olds, they will respond best, taking the whole season into consideration, to one system of handling and feeding, whereas if they are to be put on feed at the approach of grass and fattened as two year olds, they are best handled in another way.

One of the commonest mistakes is to allow what the farmer calls the "grass shrink" to occur. This means that the cattle have been allowed to remain on pasture until the grass is so short, or on account of fall rains the late growth is so immature and washy, that the animals shrink decidedly in weight. It is a universally good practice to supplement the pastures with some sort of feed the moment they become so short as to fail to maintain at least the weight of the animal. It is better to adopt the policy of feeding the animals the moment the pasture ceases to produce good gains.

Another common mistake is the turning of cattle to pasture too early in the spring when the grass is yet soft and washy and contains really very little nourishment. It is bad both for the stock and for the pasture.

Fig. 9. Harvesting pure-bred corn on the Agricultural College Farm for the silo.

As before intimated, the method of wintering should be varied in accordance with what is to be done with the animals the following summer.

If to be Grazed the Following Summer—If the steers are to be grazed the following summer, it has already been pointed out that there is a very definite limit to the amount of fat it is profitable to put on these animals in winter.

In this case the feeds to be used should be essentially the same as recommended for calves, with the difference that more field-cured corn stover and straw, particularly oat straw, may be used to advantage. But under no circumstances should cattle of this sort be wintered on corn and corn fodder, or corn and millet, or corn and timothy, or corn and sorghum, or corn and prairie hay. A legume hay is absolutely essential to the most profitable results. This is very clearly shown by a large number of experiments which have been conducted at the Missouri Experiment Station, of which the following will serve as a fair type:

THE VALUE OF DIFFERENT ROUGHAGES IN WINTERING YEARLING CATTLE.

		Total gain per lot.
6 lbs. shelled corn; timothy hay	Total	318 lbs.
6 lbs. shelled corn; clover hay	Total	641 lbs.
6 lbs. shelled corn; millet hay	Total	119 lbs.
6 lbs. shelled corn; sorghum hay	Total	166 lbs.
6 lbs. shelled corn; one-half corn stover, one-half clover hay.	Total	533 lbs.

With steers of this sort, from four to six pounds of shelled corn per day is as much as can profitably be fed under the circumstances, and this may be omitted entirely if corn silage made in the proper manner be used instead of corn stover. In that case about 15 to 25 pounds of silage and from one-half to two-thirds of all the legume hay they will eat and access to corn stover or straw will supply conditions most favorable for cheap and liberal gains.

If Cattle are to be Fed the Following Summer—In this case it is usually good policy to increase the grain the middle of February or first of March, and have the animals in good strong thrifty condition by the time grass comes. The presence of fat stored in winter will not be deleterious to the gains made in summer on full feed, and will materially shorten the summer feed required. No change in the kind of feed to be used would be recommended. Ordinarily it is not advisable to undertake this heavier feeding earlier than the latter part of February or the first of March, because it is seldom profitable to attempt to make heavy gains during the unsettled weather of late winter. By the middle or latter part of March, however, or about the time the cattle will be normally well started on half feed, weather conditions are very favorable for cheap and rapid gains. When grass comes the animals may be continued on half feed through May and June, or may be even reduced somewhat below half feed. Or, the grain ration may be gradually increased until they are on full feed, depending entirely upon the state of the market, upon whether it is important to get them finished early or not, and upon the kind of grass. If the weather is disposed to be somewhat dry and the earlier growth of grass is very nutritious and palatable, they will make excellent gains and go on fattening on a limited supply of grain. If, on the other hand, the season be rainy and warm and the grass rank and washy, the tendency of the cattle will be to grow and not to fatten, unless they are crowded on full feed, and even then it is oftentimes difficult to more than make a big growth during these two months.

If the Cattle are to be Sold as Feeders—In case the cattle are to be sold as feeders, it is quite important that they be warmed out, as described in case they are to be fed. This warming process has two very important advantages.

First, it enhances very materially the appearance or attractiveness of the cattle so that they will sell more readily and at a better price than when thin and carrying a starry coat.

Second, by this process the alimentary tract is filled and the weight of the animal is increased out of proportion to the cost of the same. For example, in putting a steer on full feed there is an increase in weight of from 20 to 60 pounds, depending upon the size of the animal, that is mainly "fill," but which brings as much per pound as any other weight when the cattle are sold alive and is of value, as has already been pointed out, in making him look thicker, flank down better, have a more restful and contented expression, and in short, altogether more thrifty and attractive.

This applies to cattle to be sold from grass in the fall as well as to those which are to be offered from the wintering pens in the spring. That is, cattle that are to be sold from pasture in the fall may be very profitably fed for 30 or 40 days, or even 60 days, beginning with green corn. The gains secured and the improvement in the appearance of the animal are out of all proportion to the cost, and will be reflected in the price the animals will bring per pound and in the weights when driven over the scales.

It would seldom be found profitable to carry cattle through the third winter. That is, they should be sold the spring or fall they are two years old at least. With plenty of grass, two-year olds graze very profitably.

Gains Made on Grass in Summer by Yearlings and Two Year Olds Contrasted—Sometime ago the writer asked more than a thousand of the most successful cattlemen of Missouri, Illinois, and Iowa what was, in their experience, the average gain of yearling and two year old cattle at grass without grain, and the following is a summary of their answers;

AVERAGE GAIN PER MONTH FOR THE ENTIRE SEASON ON GRASS ALONE.

	Yearlings.	Two year olds.
Missouri	47 lbs.	53 lbs.
Iowa	48 lbs.	52 lbs.
Illinois	45 lbs.	52 lbs.

This was figured on the basis of a six months grazing period, or from about the first of May until the end of October. The cheapness of these gains will be apparent when it is realized that a liberal charge for the pasturage of cattle of this sort is from 75 cents to $1.00 per month.

Assuming that 75 cents per month be charged for yearlings, the average cost per pound of gain on the basis of the estimates in the foregoing table, taking 47 pounds per month as the average, would be approximately $1.50 per hundred.

Assuming a charge of $1.00 per month for pasturage for two year olds, and an average gain of 52 pounds per month, would make the summer gain cost an average of $1.92 per hundred.

When these figures of the cost of gains are contrasted with 6 cents, 7 cents, or 8 cents per pound for gains made in winter, the advantages of making all the gains possible in summer are self-evident.

PART II. FATTENING CATTLE FOR THE MARKET.

The man who fattens cattle for the market is not usually the man who raises cattle. The fattening of cattle has come to be a profession large enough to engage the entire attention of an important class of farmers. As a rule these feeders have no particular interest in where or how the cattle may have been raised, so long as they have been bred properly and may be bought at a price that will bear the expense of the fattening process. In the fitting of cattle for market, the laying on of fat is the prime consideration, and the doing of this in the shortest possible time, has always been regarded as especially important. In the raising of cattle, as has been pointed out in the earlier part of this article, the production of growth is of chief importance.

Growth is, commercially speaking, relatively cheap to make, and sells for a comparatively low price. Fat, on the other hand, is from every point of view the most expensive animal product to make, and has a high commercial value, because of the degree to which it enhances the value of the carcass already produced. It is in consideration of this enhancement of the value of the carcass that the fattening process is commercially possible. This is tantamount to saying that the value of an animal is enhanced by the fattening process out of all proportion to the value of the actual pounds of gain made.

THE PROFESSIONAL FEEDER AND BABY BEEF.

The professional feeder of the corn belt is not yet making baby beef. His preference is very decidedly for cattle in about their two year old form. The reasons for this have already been stated, and are more fully set forth in a discussion of the subject in the last annual report of the State Board of Agriculture, by the writer, entitled "Limitations of Baby Beef Production," and in Experiment Station Bulletin No. 76, pp. 14-31. But the man who is raising his own feeders on high priced land, with a shortage of pasture, as has already been pointed out, will be practically forced to feed his cattle out as baby beef or sell them as calves.

SEASON OF THE YEAR BEST SUITED TO FATTENING CATTLE.

The tendency in late years among our cattle feeders has been very sharply toward the abandonment of winter feeding and the general adoption of summer feeding at pasture. It appears, from the experience of these professional men and from very extensive experiments conducted at the Missouri Experiment Station, that cattle may be fitted for market in less time and at materially less cost in summer than in winter.* The following summary of the Missouri Station experiments will emphasize the importance of the summer season over winter for fattening cattle.

COMPARISON OF RESULTS OF SUMMER AND WINTER FEEDING.

	Summer.	Winter.
Time covered by experiment	3 yrs.	5 yrs.
Number of steers involved	88	105
Average number days on experiment per lot	209.3	107
Number of lots	12	....
Total grain consumed	355,334 lbs.	238,872 lbs.
Total roughness consumed	....	91,450 lbs.
Total gain in weight	43,612 lbs.	23,910 lbs.
Grain eaten daily per steer	....	21.29 lbs.
Roughness eaten daily per steer	....	8.15 lbs.
Grain required per pound of gain	8.14 lbs.	9.99 lbs.
Roughness required per pound of gain	....	3.82 lbs.
Average daily gain per steer	2.37 lbs.	2.13 lbs.

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*For a full discussion of this subject, see Missouri Experiment Station Bulletin No. 76, pp. 31-42.

The quality of the cattle used in the different experiments was essentially the same. The cattle used in the winter trials were about six months older than those used in the summer tests. In other words, the summer feeding began in the spring, when the cattle were just two years old, whereas the winter feeding experiment began in the fall, when the cattle were approximately 30 months old. This is to the disadvantage of the winter feeding, because the presumption is that the cattle being six months younger when fed in summer were making gains somewhat cheaper. It will be noted, however, that the average length of the feeding period in the winter trials was only 107 days, whereas in the summer experiments it was 210 days, or practically twice as long. This means that the summer-fed cattle were made much fatter, and it is fair to assume that whatever advantage they possessed in point of youth was more than offset by the additional length of the feeding period and the extra amount of fat they were made to carry before the experiment closed. If the comparison is unfair at all, the injustice is done rather to the summer than to the winter-fed cattle.

Fig. 10. Comfort and contentment are important factors in making rapid and cheap gains.

It will be interesting to note that the average daily consumption of roughness per head in winter by cattle on full feed was 8.15 pounds. This means that each steer ate per month about 245 pounds of hay. Rating this hay at $5.00 per ton, makes the monthly consumption 61 cents per head. If the hay be worth $6.00 per ton, the monthly charge for roughness would be 73 cents; at $7.00 per ton, the cost would be 88 cents per steer; with hay rated at

$10.00 per ton, the charge for this portion of the steer's ration would be $1.22 per month.

The price per month for pasture of steers on full feed would easily fall somewhere between 61 cents and $1.22. This means that the roughness consumed in winter will practically offset the cost of grass in summer. The problem is, therefore, narrowed down to a direct comparison of the grain required to produce a pound of beef under the two systems and the relative amount of labor and other expenses involved.

It will be observed that 10 pounds of grain made one pound of beef in winter as an average of all steers, or that a bushel of corn (for the bulk of the grain used was shelled corn in both summer and winter) made 5.6 pounds of beef.

The average of the summer trials shows that 8.14 pounds of grain produced a pound of gain, or that a bushel of corn represented 6.88 pounds of beef, a difference in favor of summer feeding of 22.7 per cent on the cost of grain alone.

It will be noted that the steers gained more rapidly in summer than in winter, the average for winter feeding being 2.13 pounds per day, and in summer, 2.37 pounds per day.

These summaries, therefore, furnish a general answer to the objections raised by numerous writers to the tendency among our feeders toward the discarding of winter feeding and the adopting of summer feeding.

Advantages of Summer Over Winter Feeding—The grounds upon which feeders base their preference for summer feeding are various and cover a wide range. The advantages of summer feeding, in the light of all the foregoing data may be summarized as follows:

First. Gains made in summer will require less grain.

Second. Steers will gain more rapidly and get fat quicker.

Third. Steers can be made thick and prime on corn and grass in summer with greater certainty, more uniformity, and with the use of less expensive supplementary feeds like cottonseed meal or linseed meal, than is possible in winter on dry feeds alone.

Fourth. The hog makes larger gains and returns more profit in summer than in winter, and there is a much lower death rate among them.

Fifth. There is a considerable saving in labor in summer feeding over winter feeding, in view of the fact that only the grain has to be hauled, and in view of the further fact that as a rule the steers need to be fed but once a day. The manure is scattered by the cattle themselves, and the hauling of it out upon the ground is dispensed with. Grass is cheaper than hay, as has already been pointed out, and makes better gains. The handling of the roughage is likewise disposed of.

KIND OF GRAIN TO USE.

In the heart of the corn belt, it goes without saying, corn must be the principal and in many cases the only grain used. Under certain circumstances it will be highly advisable to add to the grain some supplemental feed like linseed meal or cottonseed meal, but under these circumstances only in very limited quantities and mainly for a special purpose.

Generally speaking, these supplemental feeds may not be profitably depended upon for making gains, but used principally to improve the attractiveness of the animal and to tide him over the finishing period when gains on corn alone are normally slow and high priced.

Some Supplement Needed in Winter—Corn is deficient in protein. This deficiency may be supplied in practice in winter feeding in one of two ways: By using some such feed as linseed meal, cottonseed meal, gluten feed, or bran, on the one hand, or by using a legume hay for roughage, such as clover, cowpeas or alfalfa, on the other hand. Under the head of "Different Kinds of Roughage" it is clearly pointed out that the most profitable way to meet this situation is to provide a legume hay grown on the farm. It is not always, however, feasible to do this, and under such circumstances one of the supplemental concentrates like cottonseed meal or linseed meal must be used.

In twelve years of careful experimenting at the Missouri Experiment Station with a great variety of feeds, with cattle of all ages, from calves to three year olds, and of all grades, from western range cattle to the best bred market-topping natives, we have never found a situation in which we could afford to feed a ration so poor in protein as corn combined with a non-legume roughness, such as timothy hay, millet hay, sorghum hay, prairie hay, corn fodder, or straw. In other words, if we do not have a good legume roughness to combine with the corn, some supplemental feed rich in protein has always given a return in increased gains, in a higher finish, in a better bloom, and in a better selling quality that has made its use profitable. In short, in winter feeding this extra protein seems indispensable to satisfactory results.

Our experience has been uniformly favorable with the use of from two to four pounds of linseed meal or cottonseed meal per day in connection with all of the shelled corn the steers would eat when the roughage was one of these non-legume fodders. As already stated, the cheapest and most profitable gains have uniformly been from the use of corn and some legume hay for roughage, but when the use of one of these hays is out of the question, the use of a supplemental feed in winter is invariably profitable.

A Supplement not so Much Needed in Summer Feeding—Summer feeding, with bluegrass and white clover as a roughage, is quite different from winter feeding with such material as timothy hay, prairie hay, millet or sorghum for roughage. The grass is relatively rich in protein, and being quite palatable, it is presumed that the animals eat enough of it to supply the protein required over and above that which is furnished by the corn. At any rate, our ten years of experiments in summer feeding with various sorts of supplements have shown a very small profit over and above the feeding of corn straight, and in a majority of cases this profit has had to be found in the superior selling quality of the cattle rather than in the extra gains made. These experiments have included all ages of cattle, from yearlings to three year olds, and has involved a study of all the common supplements.

These definite results have come out of these experiments: A large and long continued use of a supplement has proven uniformly unprofitable. That is to say, the making of the ration one-fourth or one-third cottonseed meal or linseed meal throughout the entire feeding period of four to seven months has shown poorer financial returns than the feeding of corn straight.

The feeding of so small a proportion of supplement as one-ninth or one-eighth of the entire grain ration throughout the entire feeding period has not been uniformly profitable, but has come nearer paying out in all cases than the large use of supplemental feeds. It does seem, however, that the feeding of a limited quantity, something like two and a half to three pounds per day, of one of these supplements during the last 60 or 70 days has given uniformly satisfactory results. This amount used over this length of time seems to be sufficient to put all the bloom and finish on cattle of ordinary grade, over and above that which corn and blue grass will supply, that it is profitable to give them.

In summer, therefore, there is a very definite limit to the profitable use of these supplements, while in winter, as has already been pointed out, there is no circumstance, except with an abundant supply of legume hay, in which these supplements cannot be used in the proportions of from one-fifth to one-eighth with decided advantage.

Various Kinds of Supplemental Feeds Contrasted—As between linseed meal, old process, pea size, and standard cottonseed meal, there is in general comparatively little difference. Our experience, however, has shown that young cattle, particularly yearlings, manifest a decided preference for linseed meal, and will show a better return and a better finish from its use. With three year olds, the cottonseed meal is slightly to be preferred, the price per ton being the same. Formerly, when linseed meal was selling at from $5.00 to $6.00 per ton more than cottonseed meal, the latter was universally to be preferred, except for very young cattle, but with the two classes selling at essentially the same price, the linseed is to be generally recommended.

In our experience the hogs have done better following the linseed fed cattle than those receiving any other ration.

Concerning the various gluten feeds, it may be said that they are so variable in composition and character as to be of doubtful value. We have had one car of this feed, for example, to be quite as palatable and apparently as valuable as either linseed or cottonseed meal, and the next car quite unpalatable and undesirable. On the whole it has not given the consistent and satisfactory results we had hoped it would, and it needs to be further tested before being generally recommended.

In general, the value of bran in fattening cattle is largely over estimated, and is far beneath its cost. Except for the feeding of show cattle or the finishing of a bunch of strictly fancy Christmas cattle, the writer knows of no circumstance under which bran can be profitably used in fitting cattle for market.

In general, the same may be said of oats, except on farms far removed from the market and where the expense of transporting the oats to the railway and the hauling of linseed meal back would be prohibitive. Even under these circumstances, a good, bright clover hay, or bright, well cured, alfalfa hay would be cheaper and would serve the same general purpose on the ordinary grade of fattening cattle. This, again, does not apply to the making of show cattle, nor to the finishing of fancy Christmas cattle.

THE VALUE OF DIFFERENT KINDS OF ROUGHAGE.

The importance of roughness in fattening cattle has in general been underestimated by the feeder. This is clearly brought out by the answers to a question submitted to a large number of our most successful professional feeders sometime ago. The question put to them was: "What roughness do you prefer during the fattening period, and do you allow the steers to have all of it they will eat?" In the following summary of their answers, the most impressive fact is the great variety of opinions there expressed. Every kind of roughness produced on the farm, from the husks on snapped corn alone to the best quality of clover or alfalfa hay, fed to the full limit of the appetite of the animal, is included. Altogether 416 answers were returned, representing forty-two counties in the State. It is interesting to observe that their preferences were as follows:

KIND OF ROUGHNESS PREFERRED BY THE PRACTICAL FEEDER.

	Number.	Per cent.
Hay	54	12.9
Clover hay	50	12.0
Clover and timothy	45	10.8
Timothy hay	42	10.1
Hay and stover	24	5.8
Stover	22	5.3
Clover and stover	20	4.8
Hay and stover	16	3.8
Flax Straw	16	3.8
Snapped corn—no roughness	16	3.8
Timothy or clover	12	2.9
Little roughness—snapped corn	11	2.6
Straw	11	2.6
Hay and straw	9	2.2
Oat straw	9	2.2
Clover and millet	9	2.2
Limited roughness—ear corn	9	2.2
Sorghum and hay	7	1.7
Hay and oat straw	6	1.4
Millet	6	1.4
Prairie hay	6	1.4
Hay, stover and millet—all they will eat	6	1.4
Sheaf Oats, clover and stover	3	.72
Sheaf oats, cut and clover hay	2	.48
Hay and sheaf oats	2	.48
Mown oats	2	.48
All kinds of roughness	1	.24
Total	416	....

One would be forced to conclude, from these results, that in the judgment of the professional feeder the roughness in full feeding exerts very little influence upon the result, and is in reality a matter of comparatively little importance.

FEEDING EXPERIMENTS WITH DIFFERENT KINDS OF ROUGHNESS.

Our experiments during the past twelve years with various kinds of roughage, both for wintering and for fattening cattle show, however, that the kind of roughness does exert a profound influence upon the cost of gain and a large influence upon the finish or quality of the cattle at the end. These results for fattening cattle are none the less striking than are those for cattle that are being merely wintered.

The following tables will give in a concise form the essential results of two years' work in which timothy hay, clover hay, and cowpea hay are contrasted. These may be regarded as fairly representative of all the experiments and as an accurate forecast of what will happen whenever these feeds are offered in comparison one with another:

COMPARISON OF DIFFERENT ROUGHNESS FOR FATTENING STEERS.

First trial—1889-1900—119 days—4 two year old steers in each lot—full fed on shelled corn.

Kind of feed.	Corn eaten, bu.	Roughness eaten, lbs.	Total gain, lbs.	Av. daily gain per steer, lbs.	Pounds grain per lb. of gain.	Gain per bushel of corn, lbs.
Corn and timothy hay.........	166	3,813	802	1.69	11.51	4.87
Corn and cowpea hay..........	188	3,662	1,257	2.64	8.31	6.74
Corn, clover hay and corn stover	185	*1,626 †1,889	937	1.94	11.29	4.96

Second trial—1900-'01—105 days—4 two year old steers in each lot—full fed on shelled corn.

Kind of feed.	Corn eaten, bu.	Roughness eaten, lbs.	Total gain, lbs.	Av. daily gain per steer, lbs.	Pounds grain per lb. of gain.	Gain per bushel of corn, lbs.
Corn and timothy hay.........	157.5	2,540	789	1.97	11.19	5.00
Corn and clover hay...........	176.2	4,768	1,135	2.84	8.69	6.44
Corn and cowpea hay..........	175.3	4,783	1,134	2.84	8.65	6.47
Corn, clover and corn stover.....	176	*2,475 † 868	1,140	2.85	8.30	6.74

*Clover hay.
†Corn stover.

It will be noted from these tables that in the first trial the combination of corn and timothy produced in the one trial 4.87 pounds of gain per bushel of corn, and 5 pounds in the other, or an average of 4.93 pounds for the two trials. When, however, clover or cowpea hay was substituted for timothy, a bushel of corn was capable of producing from 6.44 to 6.74 pounds of gain, or an average of 6.58 pounds—an increase of 1.65 pounds of beef for each bushel of corn fed, due to a difference in the kind of roughness fed. With steers selling at 5 cents per pound, this means that the feeder is getting 8¼ cents a bushel more for his corn by combining it with some hay like clover or cowpea than if it be combined with good timothy.

If one-fifth of all the corn produced in Missouri is fed to cattle, the increased profits from combining it with clover or cow peas, as compared with timothy, would amount to $2,500,000.00.

Not only do the legume hays, such as clover, cowpeas and alfalfa, increase very materially the rate of gain and decrease its cost, but the steers show at the end of the feeding period a higher finish, carry more bloom, and are altogether smoother. By reason of these facts, and the further fact that they are considerably fatter, they will sell for from 10 cents to 35 cents per hundred more on the market. Moreover, it is shown elsewhere that the hog does better following cattle that are fed a legume hay than do those following a hay like timothy.

PREPARATION OF FEED.

This is one of the very oldest questions in connection with the feeding of animals. The first thought in the mind of the average man who seeks to apply better methods to stock feeding is in reference to the manner in which the food shall be prepared. To the novice it is in this line that there seems to be the greatest opportunity for reform. When the Experiment Stations were established, this was the first problem in nutrition to be attacked. Nevertheless, the practice of the feeder is not essentially different in this regard from what it was a quarter of a century ago. Particularly is this true of the feeder of beef cattle. While it has been found highly profitable to expend considerable energy and money in preparing the foods for the highly specialized dairy cow, the average beef animal seems to have time enough and sufficient energy of not a very expensive sort to do the work of dividing and preparing the feed which it was at first sought to spare him, by cutting, chafing, grinding, soaking, cooking, and so on.

We interviewed a large number of experienced cattle feeders of Missouri, Illinois and Iowa on this point, putting to them this question: "Do you crush, shell, grind or soak your corn, or do you feed it in the ear whole?"

METHOD OF PREPARATION OF GRAIN PREFERRED.

	Missouri.		Iowa.		Illinois.		All States.	
	No. Rep'rts.	Per cent.	No. Rep'rts.	Per cent.	No. Rep'rts.	Per cent.	No. Rep'rts.	Per cent.
1 Husked ear whole.........	215	29.5	15	16.6	3	8.3	233	27.3
2 Husked ear broken........	79	10.8	8	8.8	12	33.3	99	11.6
3 *Snapped ear............	91	12.5	5	5.5	2	5.5	98	11.4
4 Shelled dry..............	68	9.3	11	12.2	6	16.7	85	9.9
5 Ear first half, shelled later..	48	6.3	17	18.8	1	2.8	66	7.7
6 Ear winter, shelled summer.	38	5.3	6	6.6	1	2.8	45	5.2
7 Ear or shelled............	28	3.9	4	4.4	1	2.8	33	3.8
8 †Crushed................	47	6.3	2	2.2	4	11.1	53	6.2
9 ‡Ground.................	24	3.2	4	4.4	....	....	28	3.2
10 Ear winter, soak summer...	15	2.0	4	4.4	....	....	19	2.2
11 Shelled, soaked...........	11	1.5	6	6.6	....	....	17	1.9
12 Ear soaked..............	12	1.6	1	1.1	2	5.5	15	1.7
13 Snapped winter, ear sum'er.	10	1.4	2	2.2	....	....	12	1.4
14 Ear winter, crushed sum'er.	9	1.4	2	2.2	....	....	11	1.2
15 Crushed or shelled........	10	1.5	1	1.1	2	5.5	13	1.6
16 Ear aged cattle, crush calves and yearlings.....	12	1.6	....	....	....	....	12	1.2
17 Crushed winter, soaked summer...............	4	.5	....	....	2	5.5	6	.7
18 Ear first, shell or grind finish.................	1	.1	2	2.2	....	....	3	.3
19 Ear aged cattle, shell calves and yearlings..........	4	.5	....	....	....	....	4	.4

*Snapped corn is a term applied quite commonly in the Mississippi Valley to corn that has been broken off the stalk with the husk and shank adhering.

†The corn and cob ground or crushed together.

‡Corn meal or shelled corn ground.

These tabulated data clearly show that the bulk of the feeders give little or no attention, under most circumstances, to the preparation of the grain, or that they feed it essentially in its natural condition.

Ear Corn—For example, it appears that ear corn, either snapped* or husked, fed whole or broken, was reported as fed *exclusively* by 53 per cent of the Missouri feeders, by 47 per cent of the Illinois feeders, and by 31 per cent of the Iowa feeders, or by an average of 50 per cent of all the men answering the question concerning the preparation of feed.

It furthermore appears that ear corn was used exclusively or for a part of the year or during the early part of the feeding period by 75.6 per cent of the Missouri feeders interviewed, 71 per cent of the feeders from Iowa, and 53 per cent of those from Illinois, or an average of 74 per cent of all the feeders interviewed.

Shelled Corn—It appears, that shelled corn, dry, was fed, either exclusively, or at some season, or in some part of the feeding period, by 23 per cent of the Missouri feeders, 31 per cent of the Iowa feeders, and 22 per cent of the Illinois feeders, or an average of 25 per cent of all those interviewed.

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*Ear corn with the husk adhering.

Corn and Cob Meal—It is a significant fact that only 47 out of the 726 Missouri feeders interviewed, or 6.3 per cent, reported that they crushed their corn exclusively. Of the 90 Iowa feeders interviewed, 2 so reported, and of the 36 Illinois feeders, 4, making a total of 53 out of 852, or 6.2 per cent of all the feeders interviewed.

Corn Meal—That the feeders consider that they have not found it profitable to put much effort into the preparation of feed is still more stirkingly shown by the fact that only 24 Missouri feeders, out of a total of 726, reported feeding corn meal; only 4 out of 90 Iowa feeders so reported, whereas none of the 36 Illinois feeders followed this practice. This means that 28 out of 582, or 3.2 per cent of all the feeders interviewed, grind corn, as a regular practice, for their cattle.

Taking all of those who reported the use of crushed or ground corn, either exclusively or at some special season of the year, or at some time in the fattening process, or with some classes of cattle, it was found that but 14.7 per cent of the Missouri feeders, 12.2 per cent of the Iowa feeders, and 22.2 per cent of the Illinois feeders follow this practice.

Soaked Corn—It will be noted that a considerable number report in favor of soaking the corn instead of crushing or grinding it. Necessarily this practice is limited to spring, summer, or early fall feeding, as it is not feasible either to soak corn or to feed soaked corn in freezing weather. The results of some experiments conducted at the Kansas Station, while not conclusive, indicate that soaking was about as effective as grinding for cattle. If this be true, soaking must commend itself on account of requiring less expense than grinding, either of equipment necessary to perform the operation or of labor.

It frequently happens in summer feeding that the ear corn becomes so dry and hard that the cattle will not eat enough to make good gains. This is especially true when one is feeding a variety of corn with rough grains, closely compacted on a hard cob. In this case the corn must either be shelled, crushed or soaked. On many farms the soaking is the cheapest and easiest of the three operations and is perhaps quite as effective as either of the others if carefully done. Every precaution must be taken to feed it perfectly sweet, to keep the troughs cleaned out, and to change the water frequently. The customary length of time to soak corn is 12 to

18 hours, depending upon the compactness of the ear and the density of the cob. Toward the end of a long feed, shelled corn soaked 12 to 18 hours is very profitable and helpful in making a rapid finish or in maintaining rapid gains to the end.

Chafing Hay, etc.—Many attempts have been made to increase the efficiency of the ration by combining chafed hay or similar material with the grain. Undoubtedly a ration so compounded will be handled by the animal with less liability to scours and to getting off feed, and will be masticated and digested more perfectly, and will therefore be more completely utilized than when it is given in its natural state but, for the ordinary class of cattle, the labor involved has been found to be out of all proportion to the increased efficiency shown. The market does not demand that ordinary animals be made fat enough to require this nice attention to feeding. To make show animals, all of this is necessary, and is fully justified.

BETTER PREPARATION REQUIRED TOWARD THE LATTER END OF THE FEEDING PERIOD.

It is evident, from a study of the detailed answers to our question in regard to the preparation of feed, and particularly from a study of the summary of these replies just presented, that the practice of offering feed of finer texture, better quality, and higher palatability in the latter part of the feeding period than in the earlier part is well established. This is due to the fact that an animal in thin condition has a good appetite and will consume coarse and relatively cheap material in sufficient quantity to make profitable gains. Later, when the system is loaded with fat, the appetite becomes more delicate and discriminating, and requires to be catered to in quality, condition, and palatability to a marked degree, in order that a rapid rate of gain may be maintained and an economical finish be made. This is particularly true of cattle that are to be made very fat, and is more true of young animals than of older ones. It is more true of young than of older animal on account of the tendency of the former to use much of its feed for growth. In such cases a relatively large gain may show a very slight improvement in the condition of the animals. Therefore, a preparation of feed that would be wholly impracticable for the earlier or main portion of the feeding period might prove to be exceedingly profitable in the last 60 days. Failure to recognize this fundamental fact in cattle feeding distinguishes the unsuccessful feeder from the successful one.

BETTER PREPARATION REQUIRED IN SUMMER THAN IN WINTER FEEDING.

It further appears, from these replies, that the feeder offers his grain in rather better form in summer than in winter. This is primarily due to the fact that grass in summer is more palatable than is the roughage usually offered in winter, namely, hay. In order, therefore, to make sure that the cattle will discriminate against the grass to a sufficient degree, or that they will eat a sufficient quantity of grain to make rapid gains and become fat in a reasonable time, it is necessary to offer them grain in a palatable form. In winter, when the roughage is not particularly palatable, sound corn in practically any form will be preferred to hay, so there is little difficulty in maintaining the proper proportion between the grain and roughage consumed. In other words, the grass in summer is much more likely to interfere with the animal's appetite for grain than is the hay in winter.

It is furthermore true that the grain in summer is dryer and harder, and therefore more difficult to masticate than in winter. The ears of corn that have been husked and stored in a crib are by midsummer so dry and the cob is so hard that it is practically out of the question for the steer to handle it in this form profitably; especially is this true if it be one of the improved and high shelling varieties of corn like Reid's Yellow Dent, Leaming, Boone County White, etc. Some of the old and unimproved cattle corns have so soft a cob as to not require this treatment even in summer. The yield of such a corn, however, is so low as to more than offset the advantage of the soft cob in cattle feeding. Moreover, the corn by this time is quite likely to have been soiled more or less by mice and rats, unless stored with the husk on. It is a very common and well approved practice to snap the corn and store it with the husk on if it is to be fed to cattle the following summer. It is usually husked just before being offered, comes out fresh, clean, is not unduly dried out, and is exceedingly palatable.

Another point undoubtedly influencing the practice is that the corn may be soaked in summer much more conveniently than in winter, as all difficulty from freezing is avoided. The only point to be guarded against is souring. If the corn is not soaked more than twelve hours and the box is cleaned out each time, the water changed frequently and the feed troughs are carefully cleaned each day, no difficulty of this nature will be experienced. For details of the practice in these regards, the reader is referred to the remarks of the different feeders in the main tables under the head of Methods of Feeding.

MORE PREPARATION OF GRAIN REQUIRED FOR YOUNG CATTLE THAN FOR AGED ANIMALS.

This is almost self-evident. Three year old steers, for example, can handle ear corn and coarse roughage far more advantageously than can calves, say, that are just being weaned. It is not at all difficult to make a fair rate of gain on young animals, and to accomplish only this result would not require any special preparation of grain. But to make a gain that is sufficiently rapid to fatten the animal within reasonable time does require that the grain be offered in an easily assimilable form and that the roughage be of a very palatable and nutritious character. In other words, as has already been pointed out, the first draft a young animal will make on its food, outside of maintenance, is for growth, and it is necessary to induce the animal to eat and digest an amount considerably in excess of the requirement for maintenance and for growth in order to make it fat. The aged steer, on the other hand, has little use for food for growth, and puts practically its entire ration, outside of that required for maintenance, to the uses of fat production, and it is not, therefore, so vital a matter that the animal gain to the absolute limit of its capacity in order to get fat in a reasonable time or to prove profitable. Thus it comes about in practice that the feeders use ear corn for aged cattle, and crushed or ground or soaked or shelled corn for calves and yearlings.

Hogs Utilize the Waste—It will be noted that all of the discussion of this factor has so far been with relation to the influence of foods prepared in different ways upon the rate of gain of the steer, rather than upon the degree to which it is digested and utilized. This is so because hogs are invariably used to pick up whatever waste may occur from imperfect preparation of the feed before it is offered to the cattle. As a rule, hogs are worth more per pound live weight than are cattle. It is, therefore, a matter of comparative indifference to the feeder as to just how the uses of the grain are distributed between the steer and the hog.

The feeder is only interested in the total gain in live weight per unit of grain fed, and cannot, under ordinary farm conditions, afford to invest much labor and money in a preparation of the feed which increases the steer gains wholly or mainly at the expense of the hog gains. So long as the food is offered in palatable enough form to make the steer gain at a fairly rapid rate and to make it fat in a reasonable time, he is not interested in how much passes through the steer unmasticated or undigested. Whatever part of the grain the steer fails to use, the hog will utilize to good advantage.

Fig. 11. The hogs utilize the waste.

Effect of Different Feeds on Hog Gains—It is a common saying among cattle feeders that the profit is in the hog that follows the steer. Recent experiments at the Missouri Experiment Station and elsewhere clearly indicate that the amount of gain the hog makes will be affected in an important way by the kind of food given the steer which he follows. For example, it has been found that hogs following cattle eating corn and linseed meal do better than those following cattle fed on straight corn. Hogs following cattle eating corn and clover hay do better than those eating corn and timothy hay, and so on throughout the whole range of feeds. In general, feeds that are rich in protein and that favor a rapid and high development in cattle will likewise favor a rapid and high finish in the hog.

It requires no experimental data to support the statement that hogs as well as the cattle will do better on pastures with as large an admixture as possible of clover. In this connection one of the most profitable things than can be done is to prepare a clover or alfalfa pasture of sufficient size to accommodate the hogs that follow the cattle and let them graze on this clover after having cleaned up the waste from the cattle, instead of grazing on the steer pastures. This will tend to protect the steer grass from being unduly soiled by the hogs and to produce increased gain on the hogs.

Another excellent plan is to provide, if possible, contiguous to the steer pasture, a small field of cowpeas or soja beans, upon which the hogs may be turned by the middle of August or September, and have this nutritious grain to supplement the corn they pick up after the cattle. This will enable the hogs to be finished well and rapidly and will give largely increased gains at a very slight expense.

SUPPLEMENTAL GRAINS FOR HOGS FOLLOWING CATTLE.

The profits from the use of some such supplemental feed as middlings, linseed meal or tankage will be almost as striking with hogs following cattle as when given to hogs fed the grain direct. It is never profitable to feed straight corn to hogs except when they are running on alfalfa, clover, or soja bean pasture. When following cattle on the ordinary blue grass pasture, therefore, and particularly when following cattle in a dry lot, a small amount of old process linseed meal or of tankage, or if these are not available, a limited amount of middlings, will invariably add materially to the profits to be derived from the hogs. This is very clearly shown by the results of a recent experiment in Ohio,* when 1-3 of a pound of digested tankage was given daily per head of hogs following cattle on corn and mixed hay, in contrast with hogs following similarly fed cattle without the tankage. The hogs having no tankage gained 808 pounds, while those receiving the tankage gained 1,230 pounds. Conditions were otherwise identical. The amount of tankage used was 259.5 pounds, costing, laid down, $4.88, from which an increased hog gain of 422 pounds was secured. The profit from this operation will be apparent when it is realized that this extra hog gain cost but little more than 1 cent per pound.

CHANGES IN FEED AND SURROUNDINGS.

Changes in feed, or location, or surroundings of cattle that are fat should never be made, except such as are decidedly for the better, and even then should only be made when imperative. After a steer is on feed and is beginning to show fat, whatever changes in the feed are necessary must be made very gradually, and should always be in the direction of improved quality and palatability. This law will admit of no violation, except in very rare cases where the cattle show too great a fondness for the roughage and seem to be eating too little grain on that account. Even then it will be more rational to attempt to bring the grain up to a standard of excellence where it will successfully compete with the roughness rather than to lower the grade of the ration by substituting a poorer roughness. Frequently when feeding at pasture the grass becomes very soft and washy, while it remains very palatable. In this case the remedy would be a hay of good quality to temper the grass.

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*Ohio Exp. Sta. Cir. 73.

The main point insisted upon is that the quality should be improved as the animals approach the finishing point. This may in a majority of cases be most effectively done by adding a limited quantity of old process linseed meal, from one-tenth to one-seventh of their whole grain ration, during the last 60 or 80 days. This will insure a large consumption of grain and, of course, rapid gains to the end, and will materially improve the coat and enhance the selling quality of the steer over and above an equally fat one that has not had some such food as linseed meal. It goes without saying that this linseed meal should be added very gradually to the ration.

PURE WATER CONVENIENT AT ALL TIMES.

In order to secure satisfactory results in steer and hog feeding, it is of the utmost importance that an abundant supply of pure, clear, cool water be furnished. This point was strongly emphasized by a great number of the experienced feeders making reports for this bulletin. It is furthermore important that the hog be required to drink in a separate place from the cattle, and that the water for each class of stock be protected against the other class of stock. It will not do to allow the steers to drink from the hog troughs, or the hog wallows, nor to permit the hogs to foul the water in the cattle troughs.

It is a well established law that all classes of stock should be watered regularly and should have an abundant supply, but this is especially important for animals which are under the strain of rapid production, such as the highly developed dairy cow when in full flow of milk, and the growing or fattening steer when on full feed and producing to its utmost capacity. A steer on full feed in one of our experiments* voided in its dung and urine daily per thousand pounds live weight 32 pounds of water, as compared with 13 pounds as the average voiding of two other steers of the same weight that were fed only a sufficient amount to maintain body weight without gain or loss, the character of the ration being exactly the same in both cases. To restrict the amount of water drunk by the steers and hogs, either by its location being remote from the feeding troughs and pastures, by reason of its irregular or inadequate supply, by reason of inadequate trough room, by reason of its filthy condition and uninviting surroundings, is to directly restrict the gains and to reduce the profits of the feeding operation. Wherever at all feasible, a constant supply of deep-well water, freshly pumped, in troughs of adequate size, should be provided in a locality convenient to the feed troughs, convenient to the ranges, and at a point where the droppings that naturally accumulate in the vicinity of the watering trough will be of value to the farm rather than be washed away by the first rains that come after they are deposited.

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*Not yet published.

REGULARITY IN FEEDING AND QUIETNESS IN HANDLING.

Clock-like regularity in the feeding and watering of cattle on full feed is of the utmost importance. If possible, the same man even should always do the feeding, and it is important that this be the most intelligent and trustworthy man on the farm. It is scarcely possible for a man to get the best gains out of cattle and to get them all to come along uniformly and have no founders and "throw outs" unless he take a personal interest in the work in hand. To make the crop and general farm work the principal and the cattle feeding the subsidiary thing is likely to prove unfortunate for the cattle.

WHEN STEERS ARE READY TO BE MARKETED.

No sounder advice could be given the beginner than to study carefully the requirements of the market. This may be best done by visiting the market as frequently as possible and especially when the cattle of his own feeding are to be sold. To bring cattle to just the point of finish, or to just the degree of fatness that will make them most profitable, or to avoid carrying them too long, or to avoid selling them too early, is perhaps the most difficult point to determine in the entire range of beef production. No one can hope to develop good judgment in this direction without a thorough familiarity with the various market classes of cattle and without knowing how much fat each class requires to enable it to be sold to the best advantage. It would of course be fatal to follow one rule with all grades. Cattle of good quality will require a relatively higher finish because, as a rule, their cost price as feeders is so high that there will be too small a margin between it and the selling price to pay a profit if they are not made prime. Plain to common sorts, however, are not worth enough to justify being made thick fat, and must go to market carrying medium flesh if they pay a profit. The beginner, however, is more likely to err in the direction of shipping too early than of carrying his cattle too long. Frequently a six weeks' additional feed will make from 40 cents to 60 cents difference in the price of the cattle on the market. On the basis of 1,400 pound steers, this equals from $5.60 to $8.40 per head besides the value of the gains made. On the other hand, money is frequently lost by making cattle too thick, especially when they have not the quality to pay for so long a feed. Or, it may happen that the top of the market is not enough above the price commanded by good to choice cattle to pay for making them prime. To top the market and lose money is not profitable.

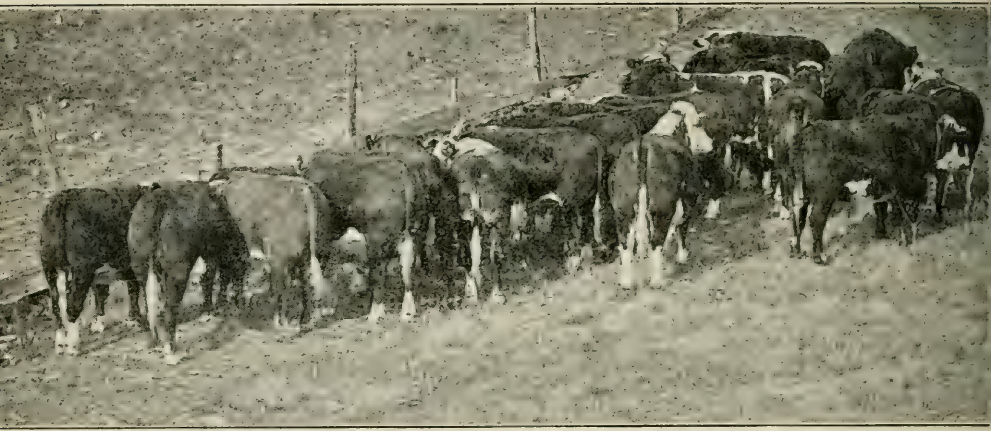


Fig. 12. Cattle having enough quality to justify being made thick fat.

RATIONAL SHEEP FEEDING.

(Frederick B. Mumford, Professor of Animal Husbandry, University of Missouri.)

In any scheme of stock farm management the rations fed to the domestic animals are an important factor in the final result. This fact has been recognized not only by the practical farmer, but by the Experiment Stations of the United States. This is indicated by the very large number of feeding experiments which have been conducted at these institutions. It is probable that more experiments have been conducted in the feeding of farm animals than all other phases of animal production combined.

We have yet much to learn regarding the fundamental facts of animal nutrition. The farmer would like to know, for example, whether it is on the whole more profitable to feed calves, colts, lambs and pigs a generous ration of nutritious concentrates like grain, from birth to time of selling, or whether it may not be more profitable to feed animals on cheaper rations requiring a longer time to properly develop the animal. The feeder is also interested to know what is the profitable amount of grain above mere maintenance which can be fed profitably.

While there are still unsolved problems the stations have successfully established certain principles of feeding, which are of great value in determining the most profitable methods of feeding all kinds of domestic animals. It will not be possible in the limits of this article to cover completely the whole subject of sheep feeding. We can but hope to point out some of the principle facts which should govern our practices. In general, we may divide the subject of sheep feeding into three classes:

(1) The feeding of breeding animals.

(2) The feeding of young lambs.

(3) The finishing of partly grown lambs or of wethers by full feeding with grain.

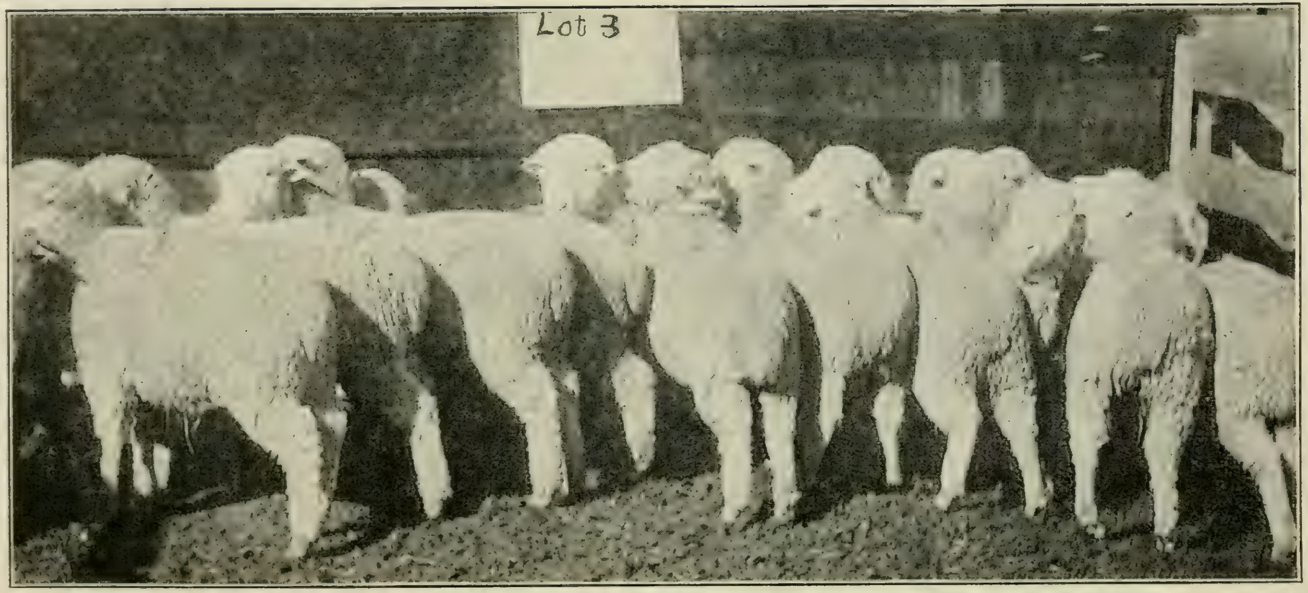
FEEDING OF BREEDING EWES.

There are certain fundamental principles which govern the care and handling of all breeding animals. It is a mistaken idea that sparse feeding is favorable to reproduction. It is, however, true that a method of feeding which induces excessive fatness is unfavorable to reproduction. A full and generous supply of food throughout the year is the best possible practice for handling the breeding ewe.

Another point that is often overlooked in the handling of the ewe flock, particularly in winter feeding, is exercise. It is in the highest degree unwise to take a flock from summer pasture, where they have enjoyed unlimited freedom and constant exercise, and shut them in a small yard and keep them there the entire winter. The ewe flock should be insured a constant and regular amount of exercise throughout the year.

SUMMER FEEDING OF BREEDING FLOCK.

Under ordinary conditions there is no need of feeding grain to breeding ewes in summer. The sheep is one of the most success-



Lot 3. Corn, linseed meal and clover. Twenty western yearlings. Feeding period, 14 weeks. Total grain, 2,420 pounds. Total hay, 3,314 pounds. Total gain, 495 pounds. Average daily gain, 0.25 pounds. Cost of one pound gain, 7 cents.

ful and persistent grazing animals on the farm. They will eat a much larger number of plants than either horses or cattle and are often useful in clearing a pasture of weeds and brush.

Ewes are ordinarily bred in the fall, and at this time the pastures are frequently short and the animals really suffer for a generous supply of good food. It is always desirable before mating to give the ewe flock a generous supply of food for at least two weeks before turning in the ram. If possible turn the ewes on fresh pasture. It is also a good idea to feed them heavily with grain during this time. This practice is called "flushing" by the English sheperds, and the claim is made, not without some reason, that this insures a larger number of lambs, that the ewes come in heat more uniformly, and that the lambs are stronger and healthier at birth.

When the ewes are taken from the pastures in the fall they may be infested more or less seriously with sheep ticks, and if they are not treated for this condition the parasites will interfere seriously with their thrift during the winter. It is always a good practice, therefore, to dip them in some good dip which will kill the ticks. This should be done before cold weather.

The ration for the winter should contain some grain; ½ pound of corn per sheep each day, together with all the clover, alfalfa or cowpea hay that the sheep will eat is a good ration for breeding ewes. Some corn stover is an excellent roughage, and will be relished by the ewes. In case it becomes necessary to feed the ewes through the winter without clover, alfalfa or cow pea hay, then the grain ration should be of corn and linseed meal, in the proportion of 5 of corn and one of linseed meal, or of corn and bran. This, with stover, mixed hay and possibly some straw, will bring the ewes to lambing time in strong condition. Timothy hay is a very unsatisfactory roughage to feed to sheep. It is best to have the lambs come in February or March, provided warm quarters could be supplied. Otherwise April 15th to May 1st is perhaps a better time. After the lambs have been born the ewes should be fed heavily on grain, and in the writer's opinion the lambs should be fed from birth until time of selling. It is customary to provide a lamb creep (a small pen) in which the lambs may go to eat and find hay, and into which the older sheep cannot go. It is undoubtedly true that the grain fed to lambs at this time will yield a greater return in gains made than at any other time in the life of the lamb. If the lambs come in February or March and are full fed they should be sold in June. If they come in April or May they must be kept longer and will probably sell in the fall as fat, if they have been fed grain constantly, or as stocker lambs, if they have not been fed continuously.

THE FEEDING OF FATTENING LAMBS.

A practice which is becoming more and more common in the corn belt is the finishing of lambs or wethers during the winter months. In most cases the stocker lambs are purchased from the ranges of the west, weighing from 55 to 70 pounds. These are fed for 60 to 90 days and are sold as fat lambs on the market. There are varying methods of feeding to bring about this result.

A method which is now rather common is to buy these lambs rather early in the fall, run them on grass pastures with a little grain for 30 days, and then gradually put them on a full feed of grain.

A method which has found much favor in this section is to sow rape and cowpeas in the corn at the last cultivation, and about the first of September turn the lambs in on the corn. The lambs will clean up the under growth and weeds, and the lower blades of corn, but will not for a time injure the corn. Some feeders in Missouri have been able to pasture ten lambs per acre for eight weeks, and have secured a gain of 20 pounds on each lamb, or 200 pounds of mutton per acre, without in any way injuring the corn.

The most common method of feeding, however, is to put the lambs in feed yards with open sheds for shelter and feed them from 60 to 90 days on a ration of corn and hay.

The following tables give the results of a large number of experiments with different rations for finishing lambs.

In the tables following, the cost of the various food-stuffs used in the experiments are as follows:

Corn	$0.40 per bu.
Oats	.32 per bu.
Wheat	.60 per bu.
Oilmeal	$25.00 per ton.
Bran	14.00 per ton.
Roots	2.50 per ton.
Silage	2.50 per ton
Clover hay	7.00 per ton.

RATIONS FOR FATTENING LAMBS.

Especial attention is called in each case to the column headed "cost of 1 pound gain in cents," "the average weekly gain in pounds," and the "dry matter for 1 pound of gain in pounds." These columns contain the essential comparisons and indicate which of the rations fed were most efficient.

EXPERIMENTS IN FATTENING LAMBS.

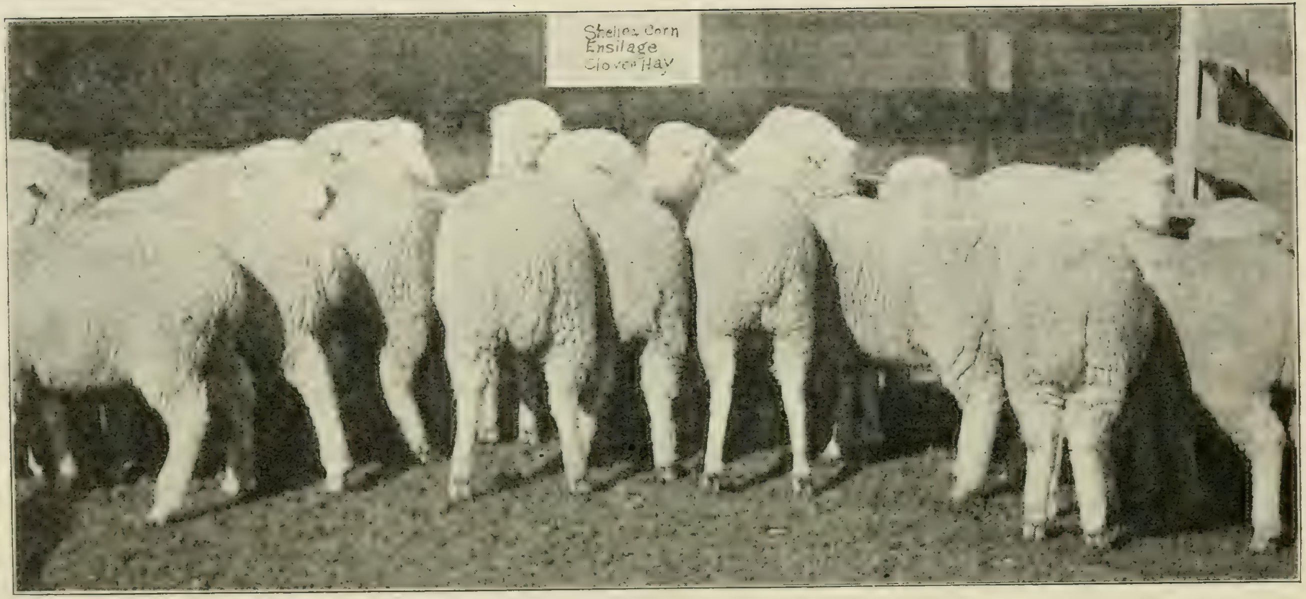
10 lambs in each lot. Roughage ration, clover hay.

No. of Lot	Distinguishing rations.	Grain, lbs.	Hay, lbs.	Roots Rutabagas, lbs.	Total gain, lbs.	Average weekly gain, lbs.	Cost of one lb. gain, cts.	Dry matter for one lb. gain, lbs.
1..	Corn (shelled)	1,757	1,675	1,190	443	2.6	4.5	6.95
2..	Oats	1,963	1,694	1,190	379	2.2	7.1	8.68
3..	Bran	1,779	1,728	1,190	242	1.4	8.25	12.9
4..	Corn ½, oats ½ (Wt)	1,735	1,711	1,190	436	2.6	5.1	7.11
5..	Corn ½, Bran ½ (Wt)	1,973	1,698	1,190	358	2.1	6.0	9.14
6..	Oats ½, Bran ½ (Wt)	1,957	1,722	1,190	361	2.1	6.7	9.13
7..	Corn ⅓, oats ⅓, Bran ⅓ (weight)	1,968	1,654	1,190	387	2.3	5.8	8.37
8..	Roots (Rutabagas)	1,173	1,220	6,706	393	1.7	7.7	9.23
9..	Silage	1,173	987	*4,504	384	1.7	6.3	10.01
10..	Self feed, corn ⅓, oats ⅓ and bran ⅓	2,120	528	1,360	260	2.17	8.0	9.45
11..	Corn	1,579	1,097	......	328	2.18	4.6	7.02
12..	Corn and Roots	1,612	964	2,720	397	2.64	4.6	6.41
13..	Corn 6/7, linseed meal 1/7 and roots	1,716	967	2,675	392	2.61	5.3	6.72
14..	Corn 6/7 and linseed meal 1/7	1,735	1,158	......	357	2.38	5.1	6.99
15..	Corn ½, and bran ½	1,703	1,124	......	267	1.78	6.0	9.13
16..	Wheat ½ and corn ½	1,485	1,118	......	295	1.97	5.4	7.64
17..	Wheat ⅞ and linseed meal ⅛	1,530	1,147	......	291	1,94	6.3	8.04
18..	Corn (self feed)	1,506	961	......	248	1.65	5.5	8.57
19..	Corn½ and bran ½ (self feed)	1,838	959	......	237	1.58	6.8	10.03
20..	Corn ½ and wheat ½, (outdoors)	1,196	1,087	......	205	1.57	6.8	9.65
21..	Corn ½ and wheat ½, (indoors)	1,164	1,173	......	230	1.77	6.1	8.77
22..	Corn	1,208	1,142	......	233	1.80	5.4	8.12
23..	Wheat	1,201	1,199	......	217	1.67	7.5	9.56
24..	Corn ½ and wheat ½ (lambs sheared December 1)	1,266	1,336	......	161	1.24	9.9	13.97
25..	Sugar beets	*5,685	1,181	......	116	.89	8.7	15.60
26..	Corn, wheat, oats and bran (self feed)	1,460	924	......	206	1.58	7.6	10.04
27..	Corn and wheat	1,232	1,209	......	249	1.91	5.9	8.43

*Silage.
*Sugar beets.

SHELTER FOR FATTENING SHEEP.

Experiments at this station and elsewhere have clearly demonstrated that warm barns for fattening sheep are not desirable. Sheep are naturally well protected, and the effect of dry cold is rather a tonic than otherwise. It certainly is not true that fattening sheep require more feed per pound of gain in cold weather than in warm weather. One of the experiments in the series summarized in the table was undertaken for the express purpose of investigating the effect of feeding fattening sheep that were kept in a closed pen open to the south, in a barn with windows open on the south, as compared with another lot of lambs fed exactly the same ration but permitted the run of a large yard in connection with similar shelter. Lot 20, in the table, was permitted the run of a large


Shelled Corn
Ensilage
Clover Hay

Lot 5. Ration: Corn, corn silage and clover hay. Twenty western yearlings. Feeding period, 14 weeks. Total grain eaten, 2,429 pounds.

Total silage eaten, 1,550 pounds. Total hay eaten, 2,498 pounds. Total gain, 533 pounds.

Average daily gain, 0.27 pounds. Cost of one pound gain, 5.9 cents.

yard outdoors and was allowed to go in and out of the barn at will. They were never shut in even during the severest weather, and they were consequently frequently drenched with rain or covered with snow. Lot 21 was fed exactly the same ration inside. The comparisons are given in the following table:

TABLE 2.

Distinguishing difference.	Lot	Grain	Hay	Water	Cost of 1 lb. gain cts.	Total gain	Average weekly gain.	Total dry matter.	Dry matter to 1 lb. gain.
Outdoor............	20	1,197	1,087	1,228	6.8	205	1.57	1,978	9.65
Indoor.............	21	1,164	1,173	2,073	6.1	230	1.77	2,019	8.77

The results are not very definite nor conclusive, based as they are upon a single experiment, but the facts are that the sheep in the outdoor lot consumed a little more grain, and some less hay than the indoor lot. The increase in live weight was considerably in favor of the lot fed outside. The amount of dry matter required to produce a pound of gain was in favor of the indoor lot. Under the conditions governing this experiment the net profit from the sheep fed indoors was 12 cents per head greater than the lot fed outdoors.

In the writer's experience it seems to be undoubtedly true that sheep do not suffer from dry cold weather, and that providing they can be kept dry they can endure any amount of cold without discomfort. In humid regions, therefore, where rain and snow fall frequently during the winter it will be profitable to supply them with a dry shelter, but not necessarily warm.

SHEARING LAMBS IN FALL.

Lambs are sometimes shorn in the fall at the beginning of the feeding experiment. Such experiments as have been conducted where sheep have been shorn rather late in the fall have not proven entirely satisfactory. In other experiments where sheep have been shorn early in the spring toward the close of the fattening period the results have been quite uniformly successful.

In table 3 are recorded the results of an experiment in which one lot was shorn December 1st and another lot left unshorn and fed the same grain ration.

The shorn lambs were fed in the same barn with the other lots under experiment, and were subjected to the same conditions except that their pen was protected by a tight board partition extending to the ceiling and entirely enclosed the feeding pen. The pen was supplied with a window opening to the south like the other lots, but unlike the others, this window was kept closed continuously throughout the experiment. Notwithstanding this precaution the sheep gave evidence of suffering from the rigors of winter. It is possible that if still warmer quarters could have been given this lot the results here recorded (table 3) would have been less disparaging to the lot shorn in the fall.

The lots compared were lots 21 and 24.

TABLE 3. EFFECT OF SHEARING LAMBS IN THE FALL.

Distinguishing difference.	Lot.	Grain.	Hay.	Water	Cost of 1 lb. gain cts.	Total gain.	Average weekly gain.	Dry matter to 1 lb. gain.
Unshorn....................	21	1,164	1,173	2,073	6.1	230	1.77	8.77
Shorn December 1...........	24	1,336	1,336	1,848	9.9	161	1.24	13.97

The shorn lambs (lot 24) made smaller gains, ate more food and consequently required more dry matter to produce one pound of gain than did the lambs fed in exactly the same manner and unshorn (lot 21). An examination of the financial statement in connection with lots 21 and 24 will reveal the fact that in this experiment at least there was no advantage, but, on the contrary, a decided disadvantage from fall shearing.

No one experiment can furnish sufficient data for definite and sweeping conclusions, but the above results are significant and probably point out the general result which may be expected from such practice.

ECONOMY OF A SELF-FEEDER.

A self feeder is an arrangement by which animals may supply themselves with grain at all times. The usual method of feeding is to fill the grain racks once in three or four days, or perhaps only once each week. The practice differs somewhat in different localities, some feeders supply the grain to the fattening animals as described above, while others clean the feeding troughs daily, furnishing no more food than will satisfy the animals until the next feeding time. The two practices are essentially the same in character and results. This method of fattening is popular, especially with those feeding a large number of animals, requiring the attention of several feeders; but we have found it in common use among those who fatten but a small number annually. An investigation of this practice draws attention to two points: 1. Effect on the gain in live weight. 2. The relative amount of dry matter required to produce the gains made.

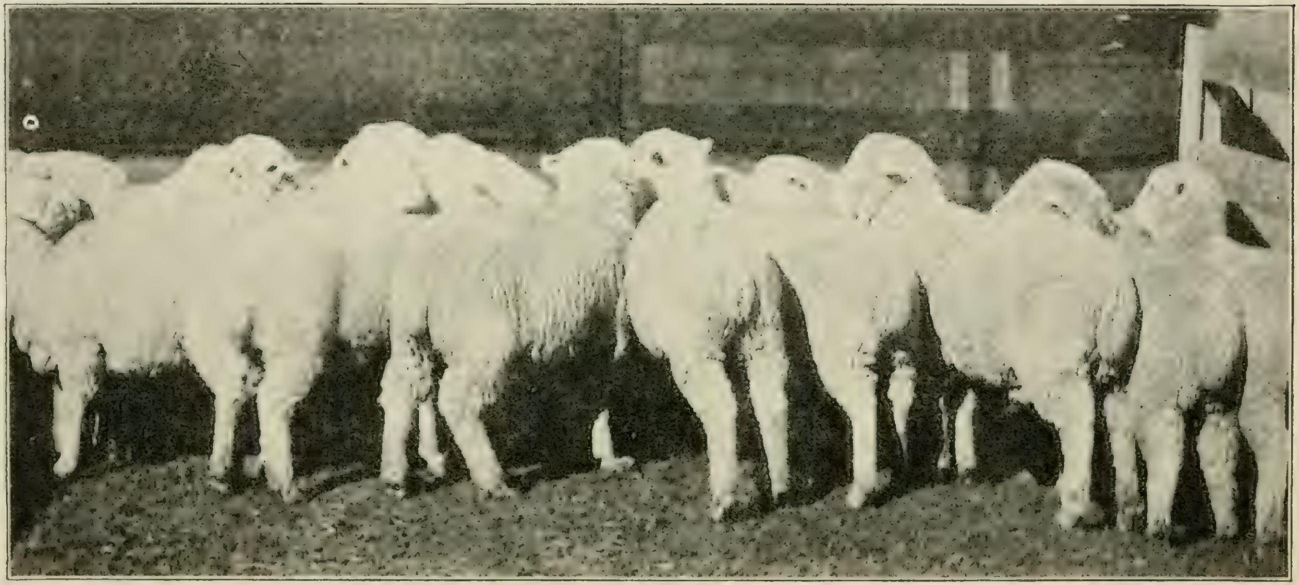
Below will be found a table which includes the data collected in our investigation of this point in the season, 1894-5:

TABLE 4. ECONOMY OF A SELF-FEED—1894-5.

Distinguishing rations.	Lots.	Grain.	Hay.	Water.	Cost of 1 lb. gain, cts.	Gain.	Average weekly gain.	Dry matter to 1 lb. gain.
Regular feeding.............	21	1,164	1,173	2,073	6.1	230	1.77	8.77
Self feed....................	26	1,460	924	2,547	7.6	206	1.58	10.04

In the above table, lot 21 was fed twice each day, as described in previous pages of this bulletin. The ration of lot 21 was composed of equal parts by weight of corn and wheat mixed, and clover hay. Lot 26 was fed by means of four self-feeders, one containing corn, another bran, another wheat, and still another oats. These self-feeders were kept filled with grain, but were so constructed that the food worked its way down to the feeding trough no faster than the animals ate it from below. In previous experiments we have mixed the grain for the animals and supplied it to them through one rack, but we believe the arrangements described above is preferable.

The lambs (lot 26) ate five hundred and fifty-six pounds of corn, four hundred and sixty-seven pounds of bran, two hundred and forty-seven pounds of oats and one hundred and eighty-nine pounds of wheat. This is seemingly a very favorable showing for corn, as the main food in the fattening ration. Referring again to table 4, it will be observed that the self-fed lambs ate considerably more grain, a little less hay, drank more water, and made a smaller total gain than lot 21 fed in the ordinary way. The point of greatest significance, however, is the amount of dry matter required to produce a pound of increase in live weight, and this is manifestly greatly in favor of lot 21, receiving its food regularly at stated times. Lot 26, fed by means of self-feeders, required 10.04 pounds of dry matter to produce one pound of gain, while lot two required



Lot 6. Ration: Corn and clover hay. Twenty western yearlings. Feeding period, 14 weeks. Total grain eaten, 2,988 pounds. Total hay eaten, 2,501 pounds. Total gain, 481 pounds. Average daily gain, 0.24 pounds. Cost of one pound gain, 6.9 cents. (Automatic feeder—self-feed.)

but 8.77 pounds. In this experiment the results are clearly against the use of the self-feeder. The total gains made and the amount of food required to produce a given increase in weight all seem to be distinctly favorable to the practice of regular and systematic feeding conducted with judgment on the part of the attendant.

TABLE 5.

THREE YEARS FEEDING WITH A SELF-FEEDER.

Year.	Grain.	Hay.	Roots.	Total gain.	Average weekly gain.	Dry matter to 1 lb. gain.
1892-3	2,120	528	1,360	260	2.17	9.5
1893-4	1,503	713	....	212	1.77	9.57
1894-5	1,341	854	....	208	1.73	9.66
Average	1654.6	698.3	....	226.6	1.89	9.57

TABLE 6.

THREE YEARS FEEDING CORN—REGULAR FEEDING.

Year.	Grain.	Hay.	Total gain.	Average weekly gain.	Dry matter to 1 lb. gain.
1892-3	1,123	1,225	300	2.5	6.76
1893-4	1,253	914	286	2.38	6.58
1894-5	1,132.3	1,056	237	1.97	7.57
Average	1,169.3	1,065	274.3	2.28	6.97

Tables 5 and 6 contain the average results of three years' experiments with lambs fed corn and clover hay and supplied in the ordinary manner. The results are reduced to the uniform period of twelve weeks. In every instance the lambs fed at regular intervals (table 6) made the greatest gains and produced those gains at the least expense of dry matter. The experiments are quite conclusive, extending as they do over a period of three years under varying conditions and with different lots of sheep. We are led to the conclusion that fattening lambs by means of a self-feeder is an expensive practice, and that economy of production requires more attention to the variation in the appetites of the animals than can be given by this method.

FEEDING ON RAPE AS A PREPARATION FOR WINTER FATTENING.

Rape has been somewhat extensively used at this Station and throughout the State for the fall pasturage of sheep intended for winter fattening. It has rapidly grown in favor, since it produces a large amount of forage to the acre, and the efficiency of this material for fattening sheep and the ease with which it may be grown, all commend it to the practical sheep man. It may be used as a catch crop after oats and peas, which have been cut for hay, or even after an ordinary hay crop. As a rule, lambs may be pastured on rape from September 15th to November 15th at the rate of fifteen or twenty lambs per acre, and they should gain in this time twenty pounds each.

The experiments with rape at this Station have indicated that rape-fed lambs were in much better condition at the beginning of winter than those pastured on grass. This fact has led us to consider whether more profitable grains might not be made by lambs in poorer condition at the beginning of the fattening period. To test this matter an average lot of lambs was selected from the flock and placed upon a second growth timothy and blue grass meadows, for comparison with the main flock, which had been turned on rape. The rape-fed lambs gained much more rapidly from the first than those upon the meadow and at the time of placing in the barns for the winter's experiments, ten of the rape-fed lambs weighed 851 pounds, while the same number of pasture-fed lambs weighed only 799 pounds. The following table illustrates the main points of difference between the two lots from the beginning of the winter period of fattening to its close:

TABLE 7.

RAPE AS A PREPARATION FOR WINTER FEEDING.

Distinguishing.	Lot.	Grain ration, corn and wht. lbs.	Fodder ration hay, lbs.	Water lbs.	Cost of 1 lb. gains.	Gain, lbs.	Weekly gain, lbs.	Dry matter gain, lbs.
Rape-fed..................	21	1,164	1,173	2,073	6.1	230	1.77	8.77
Grass-fed.................	27	1,232	1,209	2,191	5.9	249	1.91	8.48

The grass-fed lambs (lot 27) ate rather more grain and hay, drank more water, made somewhat larger gains and required a larger amount of dry matter for each pound of gain than the rape-fed (lot 21) lambs. A comparison of the financial statements for these lots will reveal the fact that the lot fed on rape were more profitable under the conditions existing in these experiments; but the financial results are not justly comparable from the fact that the live weight of lot two was considerably greater than lot six at the beginning of the experiment.

Had the lots at that time been of equal weight, not only the gains and amount of dry matter required to produce a pound of gain, but the financial results would have shown a slight advantage in favor of the grass-fed lambs. The difference, however, is very slight, and we must conclude from this experiment that the rape-fed lambs are not to be considered less desirable for winter fattening than those pastured on grass.

THE VALUE OF ROOTS IN A RATION.

Feeders who have employed roots largely in a fattening ration are quite unanimous in the opinion that the dry matter in roots is more equal effective than an equal amount of dry matter in fodders and grains.

The results of the experiments here recorded agree with practical experience. In one experiment in which roots were fed largely, and grain, corn and bran limited to one pound daily, it required 5.36 pounds of dry matter to produce one pound of gain. The following winter one lot fed exactly the same grain mixture, but given all they would eat and only one pound of roots daily, required 9.22 pounds of dry matter to produce one pound of gain.

TABLE 8.

Lot	Distinguishing rations.	Grain, lbs.	Hay, lbs.	Roots, lbs.	Total gain, lbs.	Average weekly gain.	Cost of 1 lb. gain, cts.	Dry matter to produce 1 lb. gain.
11..	Corn......................	1,579	1,079	....	328	2.18	4.6	7.02
12..	Corn and roots............	1,612	964	2,720	397	2.64	4.6	6.41
13..	Corn, linseed meal and roots..	1,716	967	2,675	392	2.61	5.3	6.72
14..	Corn and linseed meal.......	1,735	1,158	....	357	2.38	5.1	6.99

It will be seen from table 8, that the lambs receiving roots in their ration ate less hay, made considerably better gains and made gains on less dry matter than the lambs fed no roots.

The results may be briefly summarized as follows:

CONCLUSIONS.

1. Lots receiving corn in the fattening ration, either in whole or in part, produced the best gains, were apparently in better finish and in general were fed at a greater profit than the lots fed any other ration. (See lots 1, 4, 5, 10, 11, 12, 22, etc.)

2. A grain ration made up exclusively of wheat bran proved to be inferior for fattening lambs. (See lot 3.)

3. Feeding by means of a "self-feeder" is an expensive method of fattening, and is not to be recommended either from the standpoint of total gains made or the amount of dry matter required to produce a given gain. (Compare lots 7 and 10; 11 and 18; 15 and 19, and 21 and 26.)

4. Wheat bran costs more, pound for pound, than corn, and hence can not be fed profitably in this State, except when it approaches very closely the value of corn.

5. When roots are fed in a ration better gains are made and less dry matter is required to produce one pound of gain.

6. Shearing lambs late (March 8) in winter during the feeding period increases the rate of gain.

7. Shearing in fall (December 1) was not followed by good results and in these experiments was not as profitable as feeding unshorn lambs. (Compare lots 21 and 24.)

8. The animals fattened on rape during the fall and in good condition at the beginning of the experiment were essentially as successful feeders as those in poorer condition that were pastured on grass during the same fall period. (Compare lots 21 and 27.)

9. Small gains are not necessarily unprofitable nor are large gains a sure index of profitable food consumption.

10. Roots were a valuable addition to every ration to which they were added.

FEEDING THE DAIRY COW.

(C. H. Eckles, Professor of Dairy Husbandry, University of Missouri.)

There are two factors which largely control the economical production of milk. One is the adaptability of the cow used to this purpose and depends upon her individual and breed characteristics. The other is the amount and kind of food eaten. The problem confronting the dairyman is the production of the largest

Registered Jersey cows owned and bred by the Missouri Agricultural College. Average production when photographed, 16.6 pounds butter per week.

amount of milk and butter at the least expense. In order that this may be realized, both the important factors mentioned must receive careful attention.

In most cases the largest direct expense is for feed. Every one familiar with the prevailing conditions knows a large amount of feed is used without producing the returns it should. It would be safe to say that the average yearly milk production per cow could be increased by one-half or three-fourths by following better methods of feeding.

It is not the intention at this time to give results of new experimental work nor to lay down fixed rules for feeding, but to make some suggestions adapted to Missouri conditions, these suggestions being based on the facts developed by the practice of the best dairymen and by scientific experiments.

Turning on Pasture in Spring—Every owner of a cow welcomes the time when the animal can be turned out to pasture. Not only is the labor and expense connected with winter feeding done away with, but each cow is expected to give the best results of the year on grass. In changing from dry feed to grass, it is best to go somewhat slowly, especially with heavy milking cows. The young, immature grass, such as we have in early spring, contains a large amount of water and a small amount of dry matter, and it is almost impossible for a heavy milking cow to eat enough of such feed to supply the necessary amount of nutrients. Wheat and rye pastures are of the same nature. Another reason for putting cattle on pasture gradually rather than suddenly, is the effect on the taste of the milk. When a cow is changed at once from a grain ration to grass a very marked taste is developed in the milk, while if this change in feed is made gradually and not suddenly the change in the taste of the milk is scarcely noticed.

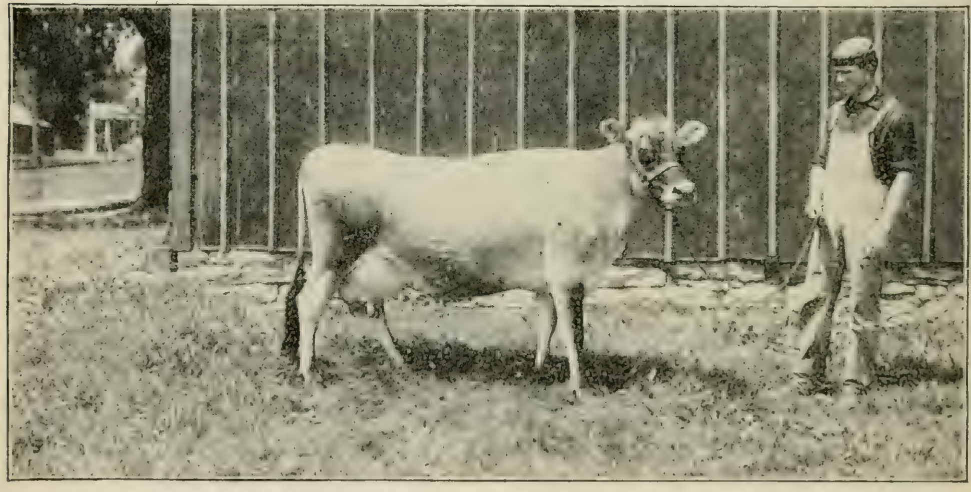
Summer Conditions to be Maintained as Near as Possible Throughout the Year—Soon after the cows are on pasture, usually the latter part of May or the first part of June, they reach the maximum production of milk for the year. This suggests that what the dairyman must do in order that the production of milk may be the largest, is to imitate these summer conditions as far as possible throughout the remainder of the year. This is what the careful dairyman and skilled feeder does, and the results correspond closely to the success with which these summer conditions are maintained. The summer conditions which bring about the maximum production and which are to be maintained as far as possible throughout the year, are described in the following statement:

1. *An abundance of palatable food.*
2. *A balanced ration.*
3. *Succulent feed.*
4. *Moderate temperature.*
5. *Comfortable surroundings.*

How these conditions may be maintained will be discussed in detail farther on.

Grain Feeding While on Pasture—There is some difference of opinion on this question from the standpoint of economy. There is no question but that a cow will produce more milk if fed grain while on pasture, and if a large yield is of more importance than economy of production, grain should certainly be fed. The cow that gives a small average quantity of milk will not produce but very little more, if fed grain while on pasture. However, with the heavy producing cow the case is quite different and it is necessary that she be fed grain or she will not continue on the high level of production for a very long time. The necessity for feeding grain to the high producing cow arises from the fact that she cannot secure a sufficient amount of nutrients from the grass alone and must have some concentrated feed in the form of grain in order to continue to produce large quantities of milk.

Experiments made by the Cornell Experiment Station, covering four years, showed that while an increase of milk yield was se-



University Dazie, pure-bred Jersey. Bred and owned by Missouri Agricultural College.

Record: 17.5 pounds butter 7 days.
70.0 pounds butter 1 month.
610 pounds butter 1 year.

cured from grain feeding, it was not economical to produce it in this way. They secured only about an additional pound of milk for each pound of grain fed. In these experiments the pastures produced an abundance of nutritious grasses. They observed, however, that the cows fed grain during the summer gave better results after the grazing period was over, than those not having received grain. This is also a matter of common observation, and should be taken into account in considering the advisability of feeding grain. The point is that the cows fed grain stored a considerable quantity of surplus nutrients on their body which were afterwards available for production of milk. Where a small amount of grain is fed, corn is as well adapted as anything else where it is cheaper than other feeds, since on account of the comparative narrow nutritive value of the grass the corn does not unbalance the ration. However, in case of feeding large quantities of grain as would be necessary in the case of cows producing from 1½ to 2 pounds of fat per day or more, other feed containing more protein should be used in part, such as bran, gluten meal, oats or cottonseed meal.

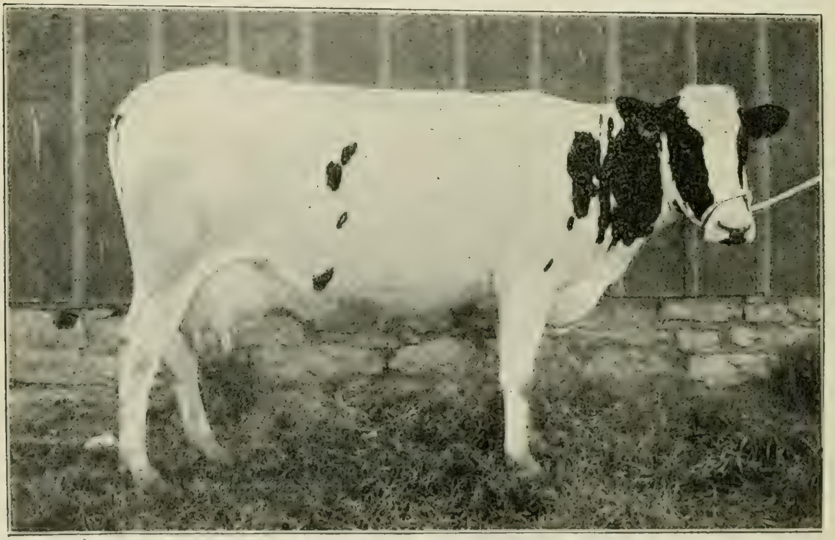
Providing for Periods of Short Pasture—As long as fresh pasture grasses are abundant, the ordinary cow is about as well provided for as she can be to produce milk economically. Unfortunately the season of abundant pasturage is often short. In many localities, a dry period, often of several weeks, occurs during the middle or latter part of the summer and the pastures become short and insufficient to maintain a full flow of milk. This season is often the critical time of the year for the dairy cow. It is probable that as much loss occurs one year with another by lack of feed at this time as occurs from improper feeding during the winter season. When the season of dry feeding arrives, the farmer expects to feed his stock and is prepared for it. On the other hand, as long as the cattle are on pasture and the field work is pressing, the tendency is to let the cows get along the best way they can.

Under average farm conditions in this State cows are fresh in the spring, give a good flow of milk while the pastures are good, but when hot weather and short pastures come the flow drops one-half or two-thirds, and the cows are almost dry at the beginning of winter. It is almost impossible to restore the flow of milk to the original amount after it is once allowed to run down from lack of feed. To make large returns from the cow a large yearly production must be had, and to do this, the flow of milk must be kept up ten or eleven months in the year. The cheapest and most efficient feed to supplement pastures during this period is probably corn, either green or in the form of silage.

Dean Waters has summed up the advantages of corn as a soiling crop as follows:

"No plant now known to us equals corn in its adaptability to the soiling system. Varieties may be selected which will yield a continuous crop of succulent food, mature enough to have a high feeding value, from the middle of June until the severe frosts of autumn. The practice of relying upon corn almost exclusively from the time the earliest variety can be brought to a reasonable state of maturity, until the close of the season, is well founded and fully justified by the results of scientific research. Corn has the advantage of yielding a larger quantity of digestible matter per acre at less cost than any other crop suited to soiling, and furthermore, it may be harvested, handled and fed more conveniently than any other crops used, and has a higher feeding value.

The problem with those who follow this system is to find



Missouri Chief Josephine. Registered Holstein, owned by Missouri Agricultural College.

Milk records:
92.7 pounds 1 day.
613. pounds 7 days.
2,535. pounds 30 days.
10,284 pounds 1 year as a 2 year old.
11,564 pounds 1 year as a 3 year old.
15,474 pounds 1 year as a 4 year old.
19.2 pounds butter 7 days.

some plant to cover the period of early spring before corn can be brought to maturity. In the solution of this problem it has been found that corn silage kept over from the preceding season will answer this purpose more fully and more satisfactorily than any other crop that can be grown at this season of the year. Thus the corn plant lends itself to the farmer who, by reason of limited area and high priced land, is forced to produce the largest possible quantity per acre, quite as well as to the farmer on the broad fertile prairies of the west, where the greatest possible number of acres must be managed by one man."

The use of silage for the same purpose is spreading rapidly and gives splendid satisfaction.

Any of the common crops which furnish green feed at this season can also be used. Next to corn, sorghum is probably used most extensively in Missouri. Where alfalfa is grown, it may be used for the same purpose.

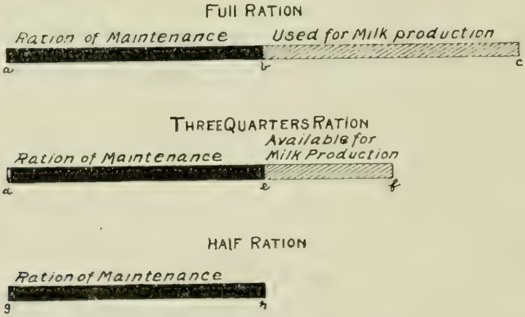
WINTER FEEDING.

Fortunately, the period of winter feeding in Missouri is shorter than in most of the dairy states. By pasturing wheat and having a blue grass pasture which has not been eaten down, to turn into late in the fall, the pasturing season can be greatly prolonged. The great problem in winter feeding, as already stated, is, in general, to maintain summer conditions. It is entirely feasible to maintain practically these summer conditions throughout the entire winter on any farm when the subject is properly understood and the necessary arrangements made. In order to point out how these summer conditions may best be maintained during the winter the statements already given will be discussed in detail.

Amount of Feed—The first condition given as typical of the summer feeding is an abundance of palatable food, and on this point is made one of the most common mistakes in feeding cows. In producing milk, the cow may be looked upon in a way as a milk producing machine which we supply with a certain amount of raw material in the form of feed, and this raw material is manufactured into milk. The same rule holds in running the milk manufacturing plant as would hold in the running of any other manufacturing plant; it is run most economically near its full capacity. Every one who feeds animals should thoroughly comprehend that, first of all, the animal must use a certain proportion of its food to maintain the body. This is the first requirement of the animal and it is the first use to which it puts its food. This we call the ration of maintenance, and it is practically a fixed charge. That is, it is practically the same whether the animal is being utilized for maximum production, or if the animal is being merely kept without producing any milk at all.

In the case of an ordinary dairy cow this ration of maintenance amounts to about 60 per cent of the ration that she is given. In the case of a heavier producing animal, for example, one producing 1 pound to 1¾ pounds butter fat per day, this ration of maintenance amounts to about one-half the total feed of the animal. It should be clear that, after going to the expense of giving the animal the necessary amount to keep her alive, it is the poorest economy to refuse to furnish the other 40 or 50 per cent which she would utilize exclusively for milk production. On the average farm this is one of the most common mistakes made. The importance of liberal feeding for economical production can be easily understood from the following illustration:

Cows of high production capacity liable to be underfed.



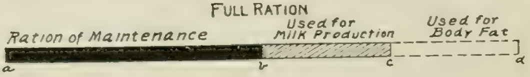
The first illustrates the proper feeding of a heavy producing cow, which is the one usually underfed. The line a—c represents the total capacity of the animal for food, or a full ration. The first half from a to b represents the amount of food required to maintain the animal's body, or the ration of maintenance. The second half, that portion from b to c, represents the proportion of the food used for the production of milk. In this case there is no fat being produced on the animal's body and the cow is supposed to be of such dairy quality that all the feed she can eat in excess of that required for maintenance is used for milk production.

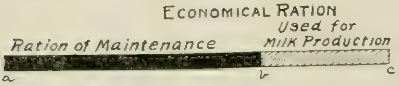
The line below represents what would happen if the feed of this animal is reduced one-fourth. The ration of maintenance remains practically the same as in the first case. The amount represented by the line d to e is the amount required to maintain the animal's body, which is the same quantity as in the first case. However, the cut of one-fourth in the ration will be seen to come entirely on that available for milk production and reduces that amount one-half.

Suppose that the ration of such a cow be still further reduced to one-half of the full ration, or that required for maintenance alone, as represented by the third line. In this case the cutting down of the ration one-half would remove all available feed for milk production. However, the animal would not cease producing milk at once. This is a point of great importance in feeding cows, and a lack of such knowledge leads to serious errors in feeding. The milk producing function is so strong that the cow will continue to produce milk for sometime, even when the feed is insufficient, utilizing the reserve material which has been accumulated in the body in the past. This always happens in the case of a heavy milking cow during the first few weeks after the birth of the calf. At this time, it is not generally possible and not desirable on account of the condition of the animal to feed her a sufficient quantity of feed to supply the nutrients necessary to produce the milk, and even if the feed was offered, the appetite is not usually strong enough to cause the necessary amount of feed to be taken to prevent this loss in weight. As a rule, all heavy milking cows decline in weight for the first two or three weeks, and occasionally for ten weeks, after calving, which means that milk production has been in excess of the feed supplied for that purpose. The same thing happens in the case of the cow that is not fed a sufficient ration for the amount of milk that she is producing. She may continue to produce considerable milk for a while by drawing on the reserve material of the body, but as soon as this is exhausted the production of milk must come down to the amount available for this purpose above the ration of maintenance. When the feed is in excess, the cow begins to store reserve material on her body. If the amount of milk produced by a cow varied directly with the feed, and she did not store up nutrients at one time and draw on reserve material at another, it would simplify the problem of feeding very much and result in more economical feeding at all times.

How to Avoid Over-Feeding—While the statement and illustration given apply to one class of dairy cows, there is another class to which it does not apply, and with which it would lead to a serious mistake in feeding from an economical standpoint. This group includes those of lower productive capacity which are liable to be over-fed, especially when they are in the herds of the dairy men, who realize the necessity of liberal feeding. The proper feeding of this group of animals can perhaps be made clearer by the following illustration:

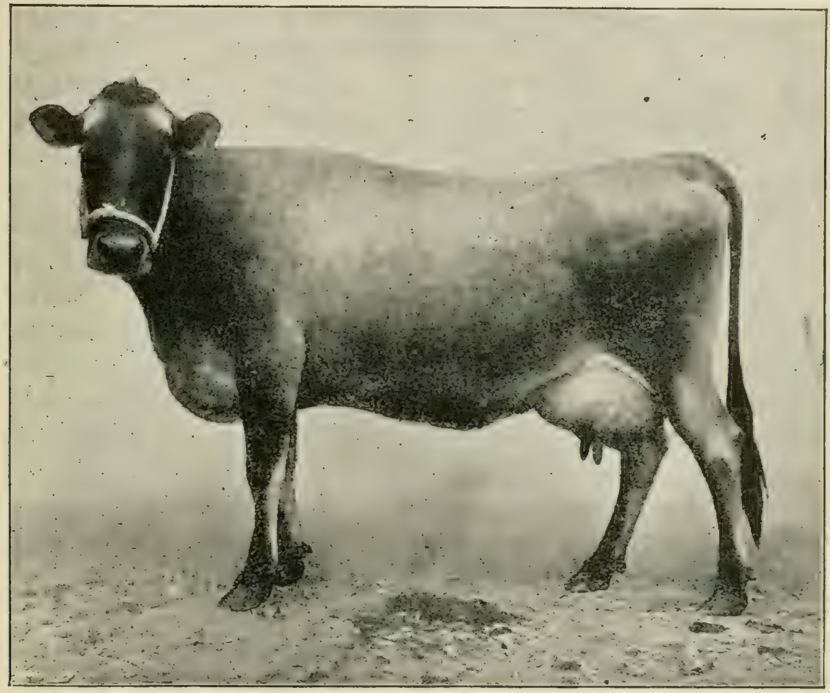
Cow of lower productive capacity liable to be over-fed.





The line a to d represents the amount of feed that an animal of this class will consume; a to b represents the ration of maintenance as before. In this case, however, the capacity for milk production is not equal to the capacity of the animal for utilizing feed in excess of that required to maintain the body. The amount which the animal is capable of utilizing for milk production is represented by that portion of the line b to c, while the animal's appetite is equal to the total line ad. This gives a surplus, c to d, which is not utilized for milk production but which will be used for storing fat on the animal's body, and we will have the cow gaining in weight while she is producing milk. This gain in weight will be of no service as far as milk production is concerned, except that it is of some value as a reserve material to be drawn upon at some other time when feed is not supplied in sufficient amounts, but it is not economical nor desirable to fatten dairy animals with the expensive feeds which are fed dairy cows. That portion of the feed represented by the line, cd, should be taken from the ration. This means reducing her feed to take off the amount used for storing fat on the body; in other words, to feed her only what she will utilize for milk production. This means feeding enough to maintain a practically uniform body weight. In every large herd where the amount fed is not carefully regulated, we find errors made in both these classes. We find the heavy producing cows being underfed, and we find the light producing cows being over-fed and allowed to accumulate fat.

Relation of Live Weight to Proper Feeding—The live weight of a cow is a good index of whether the cow is being fed a proper amount or not, but good judgment must be used in regulating the ration by observing this condition. We must expect that a cow will lose weight in the first few weeks of her milking period, but after this period is past there is no reason why she need to change much in weight for several months, and this is the period when the greater part of the milk production is secured. It will not mean, of course, that the animal should not be allowed to gain in weight during the latter end of the milking period, as this is necessary on account of the development of the foetus, and since it is natural for the animal to carry some fat on her body at calving time.



Bessie Bates. Registered Jersey bred and owned by Missouri Agricultural College. Records:

2 year old......pounds milk,	5,942......pounds butter,	345
3 year old......pounds milk,	7,592......pounds butter,	412
4 year old......pounds milk,	8,737......pounds butter,	459
5 year old......pounds milk,	10,273......pounds butter,	541
6 year old (6 mo. complete)	7,591......pounds butter,	438

It does mean, however, that in order to feed a herd of cows economically it will not do to feed them all the same quantity of grain whether they are giving a gallon of milk a day or whether they are giving four gallons, and it means that when a cow in the middle part of her lactation period is putting on weight that she is being fed more than she needs and will give just as much milk if the feed is cut down somewhat. It also means that if a certain animal is losing in weight that sufficient feed is not being given, and if the deficiency is not supplied it will not be long before the milk production will come down to correspond with the amount of feed available.

Feeding as Individuals—In connection with this subject of the amount to feed cows it needs to be pointed out that it is only possible to feed a bunch of cows economically when they are fed as individuals, and not as a herd. A too common practice, even in the otherwise well conducted herds, is for all animals to be fed the same amount of grain regardless of the period of lactation or the quantity of milk individual cows are producing. Such feeding always lacks economy, as the high producing cow does not get enough, and while she may milk very well for a short time she soon comes down to a lower level, while the lightetr producing cow usually gets too much and accumulates fat.

One of the difficult problems which confronts the practical feeder is how to adjust the quantity of feed to meet these individual requirements. It can be done fairly well even in the large herds by observing how much milk the cow is producing, and whether she is gaining or losing in body weight.

Amount of Grain and Roughness to Feed—The cow being adapted by nature for consuming bulky feeds does not feel satisfied unless she has sufficient bulk to the ration given at all times. An animal that is fed too much grain in proportion to the amount of roughness may seem hungry, while she really has a sufficient amount of nutrients, but so concentrated that it does not have sufficient bulk. In order to keep the animal filled up at all times and in the natural condition, she should be fed practically all the roughness she will eat up clean at all times, and the difference in ration given different animals should be, not in the roughness fed to any great extent, but in the amount of grain.

The following rules regarding the amount to feed cows covers the case fairly well:

1. *Feed all the roughness they will eat up clean at all times.*
2. *Feed one pound of grain per day for each pound butter fat produced per week, or one pound grain daily for each three pounds of milk.*
3. *Feed all the cows will take without gaining in weight.*

The rule regarding the amount of grain to feed per day for each cow applies best when based upon the amount of butter fat produced per week, as this makes it applicable to any breed. The second part of the rule in regard to feeding one pound of grain for three pounds of milk would not work out in all cases, since in a heavy milking Holstein cow this gives a little too large a quantity of grain, and with a Jersey giving very rich milk it is a little too low. It applies best to cows producing milk of about average composition.

REASONS FOR FEEDING BALANCED RATIONS.

The second statement regarding the summer conditions which are to be maintained throughout the year is that the animals are receiving a balanced ration. The ordinary pasture grasses, especially blue grass, when in the growing state, contains the proper proportion of nutrients to enable a dairy cow to produce the maximum amount of milk of which she is capable. The winter ration, on the other hand, is liable to have these nutrients out of proportion. This is one point wherein common practice falls far short of continuing the summer conditions throughout the winter. The feeding of a ration not properly balanced is one of the most common mistakes made on the average farm in the corn belt on account of the usual abundance and cheapness of corn and corn fodder.

All good rations contain substances which serve two quite distinct purposes when taken into the body.

First. Certain substances known as protein which build up muscle, bone and hair. Protein is found in almost all food, but in especially large quantities in alfalfa, clover and cow pea hay, bran, cottonseed, linseed and gluten meals, also in nearly a pure form in lean meat, the white of an egg, and curd in milk. No other element can take the place of protein.

Second. Another class of substances supply heat to keep the body warm, fat to be stored in the tissues as body fat or put into milk as butter fat, and energy to keep up the functions of the body.

This class is represented by two kinds of material, different in character but serving largely the same purpose in the body called carbohydrates and fats. The carbohydrates are present in large quantities and in nearly all grains such as corn, wheat and barley, and in corn fodder and timothy hay in the form of starch. In other plants, such as sorghum and sugar beets, it is found in the form of sugars. The fats are found in varying quantities in all common grains.

All properly balanced rations must contain protein, carbohydrates and fat, and no amount of carbohydrates or fat can take the place in the body of protein.

A cow secreting milk must produce substances in the milk of each of these classes. In one hundred pounds of average milk we find about 3.3 pounds of protein in form of case in (curd) and albumen, five pounds of carbohydrates in form of milk sugar, four pounds of fat in form of butter fat. Since these three kinds of solids must be present in order to form milk, it is necessary to furnish them in the feed in sufficient quantities and in about the right proportion, so there will be no loss. When this is done, the ration is properly balanced. If a cow be supplied with sufficient material in her feed to produce thirty pounds of milk per day, but on account of lacking protein produces but fifteen pounds, it is useless to further increase the fat-producing material and expect the flow of milk to be increased. The surplus fat in the feed will not be put into the milk and make it unusually rich. The results of numerous experiments carried on by various investigators show that as far as the practical feeder is concerned the proportion of butter fat in cow's milk cannot be changed appreciably by the kind of feed given. The richness of a cow's milk is a natural characteristic.

Returns from liberal feeding and care in balancing the ration should be looked for in a larger yield of milk and not in a richer milk. The quality of richness of milk is controlled by the selection of the individual animals and to a certain extent by the breed. The problem the feeder has before him constantly is how to best combine his feeds to furnish the necessary food elements in the right proportion and with the greatest degrees of economy.

As an aid in properly balancing the rations, it is useful to divide our common feeds into two classes.

Class 1. Including those feeds which contain a large amount of fat producing material (carbohydrates and fat) but which are notably deficient in protein, one of the essential substances required for producing milk and growth in young animals.

In this class we have:

Corn
Corn Fodder
Corn Silage
Timothy Hay
Oat Straw
Wheat Straw
Millet Hay
Sorghum Hay

Class 2. This class contains a much larger proportion of protein, the essential growth and milk producing elements, and smaller quantities of the fat making materials. It includes:

Clover Hay
Alfalfa Hay
Cowpea Hay
Bran
Oats
Cottonseed Meal
Gluten Meal
Linseed Meal
Soy Beans

A properly balanced ration will, therefore, include some of the feeds from each of these two lists.

Home Grown Balanced Rations—One reason why the average farmer makes a mistake of feeding his cows rations that are not properly balanced is that it is easier, or he thinks it is, to grow feeds that are excessively rich in carbohydrates and lacking in protein, and comes about principally by the large amount of corn grown and used. Many Missouri farmers have corn fodder and timothy hay for roughness and practically nothing in the way of grain but corn. From such a ration of feeds it is impossible to make a ration that supplies the necessary nutrients for very heavy production of milk. It is possible to make a fairly good ration using these feeds for roughness, but it is only possible to do so by buying large quantities of mill feeds that are rich in protein. The thing for the farmer to do is to raise the feeds he requires on his own farm, as far as possible, and it is possible to produce practically all that is needed to make a balanced ration. The place to begin in considering the feeding of an animal always is with the roughness, since the character of the roughness determines to a large extent the kind of grain it is advisable to feed.

The cheapest source of protein is in leguminous hays, including clover, alfalfa and cow pea. If an abundance of any one of these hays are on hand, the problem of making an economical balanced ration is very much simplified. The use of these hays makes it unnecessary to buy any large quantities of bran, oil meal or cottonseed meal for ordinary dairy cows, and makes it possible that the principal grain used be corn, which usually is our cheapest grain. Even cow pea or alfalfa hay alone, with corn for grain, makes a fairly good ration for an ordinary dairy cow, and such a ration could be substituted with good results for that of timothy hay and corn fodder. When hay is purchased, it is always best to purchase one of the kinds mentioned, as the price is about the same, or lower than that of timothy, which is far inferior as a milk producing food. If any hay is to be sold from the farm it should be timothy hay and not clover or cowpea hay.

SUCCULENT FEEDS.

The third summer condition, which we desire to continue throughout the winter, is that of a supply of succulent feed. By the term succulent feed is meant feed having that property possessed by green grass. Such feed has a value outside of the actual nutrients it contains on account of its favorable effect upon the digestion of the animal. There are two methods in use for supplying this succulent feed during the winter season. One is the use of root crops and the other the use of silage. In some part of the world the use of root crops is almost universal, and is the solution of the problem. In this State the use of silage is far more practical, however, than the use of root crops, and for that reason it is recommended exclusively for this purpose.

The Silo—There is no way by which the corn crop can be used to better advantage than by putting it in the silo. Probably more feeding value can be secured from an acre of corn utilized in this way than from an equal amount used for any other purpose. Silage is always relished, and furnishes a part of the roughness in a cheap and palatable form. The number of silos in use is constantly increasing, especially in the dairy sections. Silage is also growing in favor as a summer feed to supplement pastures. In feeding silage it must not be expected that it will serve as the only roughness. Hay should be fed in addition and the hay which naturally goes with corn silage is clover, cow pea or alfalfa hay. From 30 to 45 pounds per day is counted a reasonable feed of corn silage. It can be fed successfully, not only to cows producing milk, but to young stock and, in fact, almost all farm animals.

Timothy Hay—This hay is usually over-estimated in value as a feed for producing milk. For this purpose, it runs very low in proportion to its selling price. Another objection is that the yield per acre is small. When timothy hay is on hand it will pay to exchange it for clover, even at considerable expense for labor, or sell it and buy bran, or cottonseed meal. Timothy hay can be largely or entirely replaced with corn fodder, which serves about the same purpose, at a far less cost. If timothy hay forms all, or a large part of the roughness fed, it is impossible to make a balanced ration without using considerable quantities of some of the feeds rich in protein, such as bran, cottonseed meal or linseed meal. In case timothy or mixed hay and corn fodder is all the roughness available, it will pay by all means to purchase some one of these suggested to help balance the ration. For this purpose cottonseed meal is the best adapted, since it generally supplies the protein which is lacking, cheaper than any others.

The following table shows the results of a feeding experiment carried on by the Missouri Experiment Station to determine the feed value of timothy and cow pea hay:

AVERAGE PER COW FOR SEVEN COWS.

1st and 3rd period, 30 days each; Cowpea hay and corn.		2nd period, 30 days; Timothy hay and corn.	Loss by feeding timothy hay.
Milk	551.6 lbs.	472.4 lbs.	79.1 lbs.
Butterfat	26.77 lbs.	21.92 lbs.	4.85 lbs.
Weight of cows	801 lbs.	757 lbs.	44 lbs.

The table shows that during the 30 days when timothy hay was fed there was a loss per cow of 4.85 pounds butterfat and 21.9 pounds milk. In this case they had a uniform ration of grain throughout the entire experiment, the hay only being changed, and they were given what hay they would consume. But the milk and butter figures do not tell the whole story. At the bottom of the table it will be noticed that the weight of the cows decreased on an average of 44 pounds during the 30 days, a loss of over one pound per day, and in this case the ration of timothy hay was not sufficient to maintain the body weight, and if the experiment had been continued longer the results would have been still more marked.

BUYING CONCENTRATED FEEDS.

It is quite a problem with dairymen when and in what quantities to buy bran, cottonseed meal, gluten meal, or linseed meal, and which one furnishes them the most value for the money. No rule can be made to cover these cases. The whole subject of feeding and composition of feeds must be well understood in order to work to the best advantage.

If timothy, millet or sorghum hay or corn fodder is the roughness to be used, and corn the chief grain on hand, it will pay to buy bran and cottonseed meal even if some of the corn has to be sold. When cow pea, alfalfa or clover hay is used extensively the necessity of using these expensive feeds is largely done away with and only small quantities at most will be needed.

Linseed meal, cottonseed meal and the best grades of gluten meal now manufactured, are of about equal feeding value for cows, pound for pound. This class contains the largest amount of protein of any of the common feeds, and for that reason the most valuable. Gluten feeds as now sold rank about midway between this group and bran in feeding value. Bran and oats rank close together in feeding value, the oats probably being a little more valuable pound for pound. When oats are worth twenty-five cents per bushel, bran would be worth about $14.00 per ton.

Some Suitable Rations—The following rations supply the necessary material to produce milk economically. If the cow will not give a good flow of milk in the early part of the milking period and when fed a liberal amount of one of these rations, it indicates she is not adapted by nature to be used as a dairy cow and should be disposed of. The amounts given are considered about right for the cow giving from 20 to 25 pounds milk a day. For heavy milking cows these rations would have to be increased, especially in the grain, and for light milking cows the grain should be decreased. In making up these rations it is designed that the cow be given all the roughness she will eat and sufficient amount of grain to furnish the proper amount of digestible material. It is not designed that these rations should be sufficient or best adapted for cows that are being fed for making records, where a very maximum production is desired regardless of expense.

SOME GOOD DAIRY RATIONS.

Clover hay	20 lbs	Alfalfa or cowpea hay	15 to 20 lbs.
Corn	5 to 6 lbs.	Corn	8 to 12 lbs.
Bran or oats	3 to 5 lbs.		
Clover hay	20 lbs.	Corn silage	10 lbs.
Corn and cob meal	6 to 9 lbs.	Clover hay	12 lbs.
Gluten or cottonseed meal	2 lbs.	Corn	5 lbs.
		Bran	4 lbs.
Alfalfa or cowpea hay	10 lbs.	Corn silage	20 lbs.
Corn fodder	10 lbs.	Alfalfa or cowpea hay	15 lbs.
Corn	7 to 9 lbs.	Corn	8 to 10 lbs.
Bran	2 lbs.		

FEEDING AND CARE OF HORSES.

STALLIONS, BREEDING MARES, YOUNG HORSES AND WORK HORSES.

(By E. A. Trowbridge, Instructor in Animal Husbandry, University of Missouri.)

The growing demand for high class horses and mules of any of the recognized market types has placed the production of these animals among the list of profitable enterprises on the American farm. Present prices, regulated by supply and demand, do not seem

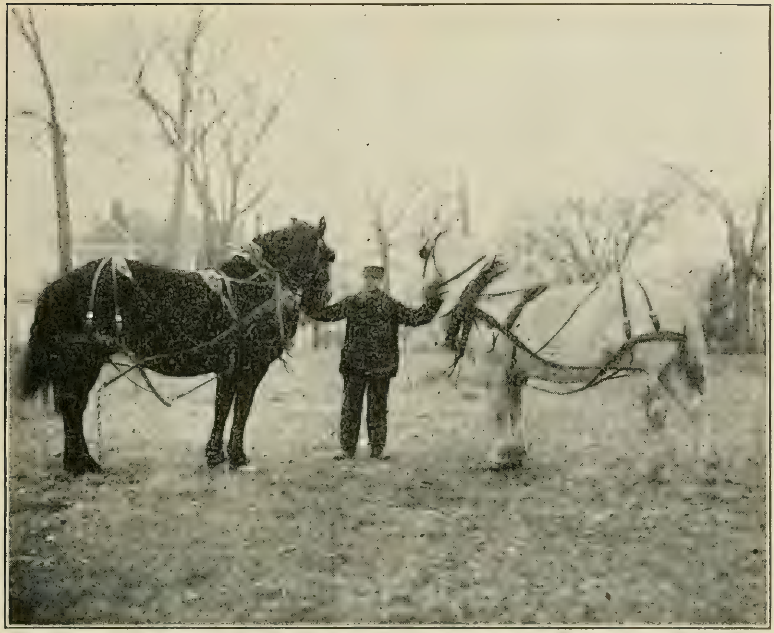


Fig. 1. Pure bred Percheron mares, Argentine and Nettie (in foal). Weight, 3,700 pounds. Owned by University of Missouri. (Photo taken February 8, 1908.)

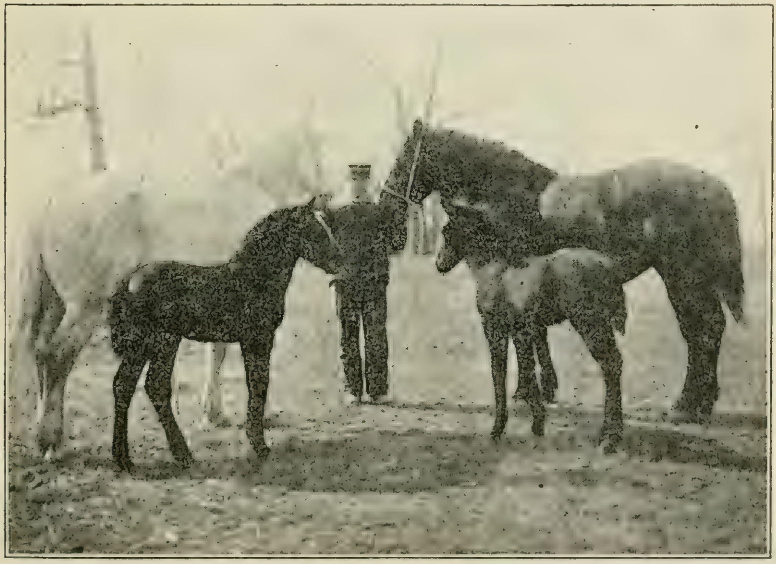


Fig. 2. Pure bred Percheron mares, Argentine and Nettie, and foals. (Photo taken March 21, 1908.) Both mares worked to ten days before foaling.

to indicate a decreasing profit from this business. The relative profit accruing from this class of animals as compared with cattle or other live stock on the farm is a good argument for its importance. The per centage of good horses in this country, today, is greater than ever before, yet there is considerable room for improvement. There are many common errors made in the care of various classes of horses with the idea of economy in view. It is, however, poor economy to starve a growing horse to save feed, for there is no other class of animals on the farm that will return bigger profits, if properly fed and developed than good horses. Farm work is not so hard but that most of it can be performed by either brood mares or horses, and mules that are too young to sell to the best advantage. For this reason the farm should be the place of production and development of even more high class horses and mules in the future than it is at the present.

The care and food accorded to the various classes of animals differs considerably, not only with the class of animals, but with the object in view. We find horses differing from other classes of animals as to their general character, their digestive apparatus as well as in the object of production. The object of production in the case of horses is their future ability to work and wear for as long a time as possible, while that of beef cattle, for example, is the fat steer in his yearling, two-year old, or three-year old form. Consequently there should be some difference between the ration of the growing gelding and the rapidly fattening steer.

It is true that the breeding animals of the various classes require much the same care and feed. Although the rations may differ as to the kind and amount of hay and grain, their fundamental composition differ very little from each other.

The growing animal to develop best must have food which supplies muscle and bone-building material, such as wheat-bran, oats, middlings, alfalfa and clover. The fattening animal needs only enough of these to replenish the body waste, but which, if it is not supplied, greatly decreases the ability of an animal to gain. The bulk, then, of the fattening ration should be of foods which produce fat.

Breeding animals need a ration rather similar to that of growing animals. For the greater part of the time breeding females are nourishing young either in foetus or after birth, while males must be healthy and vigorous, and not over fat. Their ration should produce, not high flesh but rather muscle, energy and vigor.

CARE OF STALLIONS.

The proper care of stallions does not differ materially from the care of other breeding animals. Enough of good wholesome food and water, plenty of exercise, grooming and general cleanliness, along with regular attention, are the principal factors requisite to their best welfare. Many stallions fail to be "sure" sires simply because of lack of exercise or an overgenerous allowance of poor food, two factors which, acting together, cannot lead to the best results. The swollen or scurvy legs so often seen on stallions are generally the result of insufficient exercise and lack of cleanliness.

Generally speaking, there is no good reason why a stallion should not be put to work. Such treatment insures regular feeding, grooming, exercise, and will give him the privilege of association with other horses. It will do away with the solitary confinement and irregular attention of which he is otherwise the recipient.

If, under ordinary conditions, at the close of the breeding season a stallion is pressed into regular service and accustomed to work gradually, he will be the better for it in the end. Association with other horses will then come to be a regular occurrence, and the obnoxious actions so common to stallions in harness will become less frequent. As a horse in regular service he then receives regular care and exercise. If he be from any of the lighter breeds as saddler or trotter it is by no means advisable to use him for a kind of work for which he was never intended. It is not conducive to the best development of horses to force them to do work foreign to their breeding and general character. For example, the high class carriage team may be used for farm work and serve the purpose well, but by this treatment their value as carriage horses is in most cases decreased.

If conditions are such that a stallion cannot be worked, a large paddock offers the next best opportunity for exercise. In building such a paddock it is economy to build it substantial, so that there will be no possible chance for injury to the animals. The difficulty encountered in such a method is that horses, particularly drafters, will not take enough exercise of their own free will.

Oats should constitute the basis of the grain ration for stallions. The efficiency of this grain may, in many cases, be increased by the addition of one-fifth or one-sixth bran. A limited quantity of corn makes the ration a more economical one, and may be added without injury if plenty of exercise is to be had. Roots of various sorts are palatable and succulent and often improve the stallion's allowance. Barley has been successfully used as a part of the grain ration. Some complaint has been made against the use of linseed oilmeal, and the writer would not advise its use, except in limited quantities. Good sound oats with a small portion of bran make the best grain ration for stallions.

Whatever hay is fed must be clean and well cured. Timothy and clover, a major portion of the former, has proven to be a very satisfactory hay ration. Alfalfa in large quantities as a stallion feed has been criticized, the objection being that it lessens the ability of a stallion to "settle" his mares. Corn fodder has been found to be inefficient. It contains too much crude fibre. Existing conditions will determine the quantity of both hay and grain which should be fed. A safe basis upon which to proceed is to feed one pound of grain and one pound of hay per hundred pounds of live weight. The amount should be sufficient to keep the horse in vigorous and healthy condition, yet not fat and lazy. To maintain this condition, the grain and hay will vary from the above given standard with different individuals.

If a stallion has been worked during the year, he will be in shape to start the season as it approaches. If he has not been worked, he should have had sufficient exercise, feed, and grooming to have kept him in a vigorous condition. If he is to travel, the problem of exercise is solved; if not, an eight or ten-mile drive daily will be sufficient exercise.

At all seasons of the year the stallion should be well groomed, and have a light, clean, dry and well ventilated stable. Lack of attention to these details causes skin diseases and various other troubles of more or less serious nature.

To sum up the cardinal principles in the success of caring for a stallion, plenty of good, clean food and water, enough exercise and grooming, along with a comfortable place to sleep, will, under ordinary conditions, give very satisfactory results.

CARE OF BREEDING MARES AND FOALS.

The principles governing the care of mares are identical with those governing the care of stallions but the customary treatment differs greatly. On the average farm the problem of enough exercise is not troublesome. The great difficulty is to find help that will handle a pair of broodmares carefully. Mares carrying foals may work up to within ten days of the date of foaling, and be benefited by it. They should be given moderate but steady work. Mares in foal should not be given work which requires the backing of heavy loads, or where there is a chance of slipping. But breeding mares can and should be worked. The accompanying illustration is that of a pair of mares owned by the University of Missouri, and a regular work team on the University farm.

The food for brood mares should be similar to that of the stallion. Good oats, four parts, and bran one part, along with mixed clover and timothy hay which has been well cured makes an excellent ration. The rule of one pound of grain and one pound of hay to every one hundred pounds live weight is again a good basis to work upon, along with the variation according to the individual. As the period of pregnancy advances, the ration will in most cases need to be increased, somewhat. During pregnancy particular attention should be given to the digestive apparatus of mares. They should be gaining in condition, and bowels loose at the time of parturition. It is always a good plan to feed rather sparingly for two or three days before parturition, and the ration, at that time, should consist largely of bran. After parturition it should be increased to suit the needs of the mare and foal.

Mares should be given a box stall at least four weeks before they are due to foal, in order that they become accustomed to it, and may also have a place large enough to be comfortable during the night. The stall should at all times be kept clean and well bedded, but particular care should be taken regarding these details at the time of parturition. If truly known the source of navel trouble in foals is generally due to a dirty stable or yard. As a safeguard against "navel disease," besides the scrupulously clean stall, the navel should be tied and treated with a strong disinfectant, such as a solution of carbolic acid.

If the season of the year and other existing conditions permit, mares may well be allowed to foal on grass which lessens the danger of infection.

In developing the youngsters, the first question to be settled is "when to start feeding them." The answer to this question varies with the conditions. If the foal comes in the spring it may do well, without grain for the earlier part of the season, provided the mother is a "free milker," not required as a regular work horse and allowed the run of a good pasture of bluegrass or clover and timothy. However, a small grain ration for both mare and foal will aid materially in the development of the latter. The foals should be given a chance to learn to eat grain before the season of poor pastures, for the scant supply of grass and milk must be supplemented by grain.

If there is only a small number of mares, say three or four, in the pasture, the feed boxes may be arranged far enough apart to prevent any fighting. If the number of mares is larger, or there are horses in the pasture for which the increased ration is not desired, then the mares should be "taken up" to be fed. It is here that the foal will learn to eat. It has learned to eat grass by running in the pasture with its mother, and will soon learn to nibble grain from the feed box, if given the chance. At first only a small amount of grain will be required to satisfy its appetite, but very soon an extra allowance must be made. This should be gradually increased until weaning time.

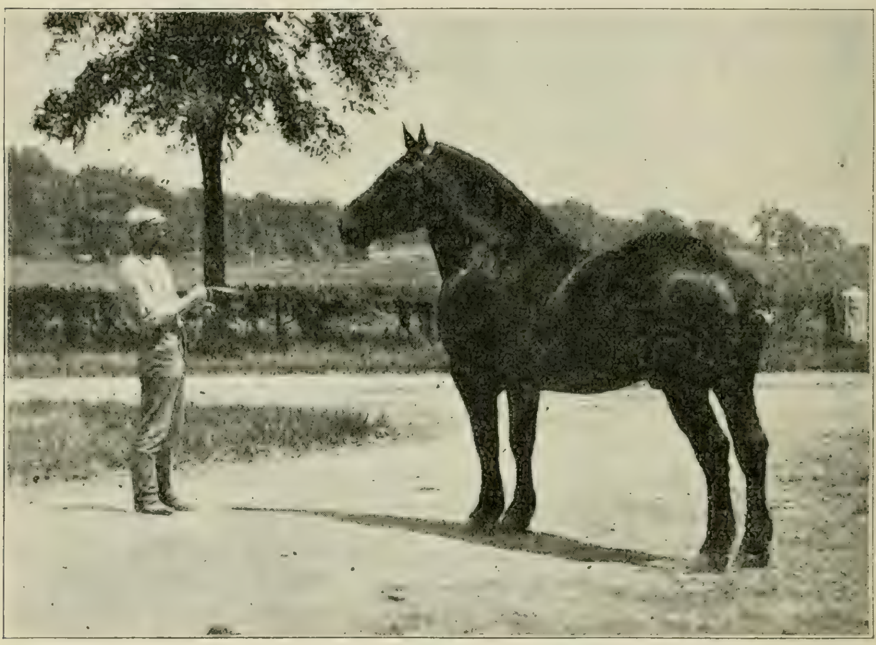


Fig. 3. Percheron stallion Pink, 24756 (47513). Twice champion at the International Live Stock Exposition, and now successful sire at Oaklawn Farm, Wayne, Illinois. Owned by Dunham & Fletcher.

Now, if it is necessary for the mare to work while suckling her foal, the proposition will be somewhat different. Having had two or three weeks' rest after foaling, she may be put back into the harness, at first working only at light work, and for a half day at a time. The foal should be allowed to nurse once in the middle of the half day for the first week. While the mare is at work it should be left in a roomy, clean and well lighted stall or paddock, where there is absolutely no chance for it to injure itself. If possible, two or more foals should be kept in the paddock together where they soon become acquainted and are much company for one another. Great care should be taken not to let the foal nurse while the mare is too warm. She should be milked nearly dry on coming to the stable, left to eat hay until cool enough for a drink of water, then taken to her own stall to eat her grain and to allow the foal to suckle. Either too much milk at one time, or milk from the dam when in heated condition, may lead to serious results. The foal will learn to eat in a very short time, and when left alone, should have sweet, fresh grain and a bucket of fresh water always in the stall. The mare should soon be able to work all day, and both she and her offspring will become accustomed to this routine. The grain allowance should be made ample for both of them until weaning time.

"What to feed" is the next question for consideration, and a very important one. The food given should be of such a character as to supply material for the making of bone and muscle. It is not fat that we desire in the young horse, but rather growth—that is, development of frame and muscle throughout.

As yet oats is recognized as the standard horse feed the country over and should constitute the basis of the ration for both the foal and the mare. As a ration upon which to start foals crushed oats and bran mixed together with a very little salt will be satisfactory. As the foal grows the crushed oats may be changed for whole oats and a small amount of ground corn added. A ration of corn and oats, one-half each by weight, does well, but the bran helps regulate the digestion. They relish the whole oats, as will be evidenced by the fact that the bran is frequently found remaining after the oats have been eaten. The only objection to whole oats for young foals is that they are not as easily digested as crushed oats. If the mares and foals are running on pasture there will be no need of roughage, but if they are kept up a very little green feed, clover or alfalfa hay put where the foal can eat it at their leisure will be helpful.

Then until weaning time oats, bran, corn, grass and mother's milk constitute a very efficient ration. The corn may be omitted entirely without depreciating the value of the ration, but its comparatively low cost warrants its limited use.

The amount of feed is a question which needs very little discussion. Grain in the before-mentioned proportions, placed where the foal may eat at will, has been found to give satisfactory results. Even while suckling they will learn to eat 3 pounds or more of the mixture per day. The grain should be changed twice a day in order to prevent scouring.

Any time between five and eight months of age will be a suitable time for weaning. A very successful method is as follows:

Take a foal away from the mare and, if possible, put two or three of them together in a light, clean, and roomy box stall. Place the accustomed grain and hay ration before them. Keep the mare far enough away from the foal so that neither may see or hear the other, and within three or four days they will have practically forgotten their former relation. In many cases, weaning may be accomplished without any noticeable loss in weight on the part of the foal.

GROWING HORSES.

After weaning, plenty of good grain and hay should be fed to the foals. The food should be of such a character as to produce the greatest growth of bone and muscle and to keep the weanlings in a thrifty condition. Oats, bran and corn, one-third each by weight, has been found to be a very successful ration for growing horses. As a roughage to be fed with this grain, alfalfa or clover, with a limited quantity of oat straw or corn stover, gives good results. Timothy and clover, about one-half each, will also be found a very successful adjunct to the above-mentioned grain ration. An error commonly made is that of feeding corn fodder and timothy hay with nothing else. This ration does not supply the proper amount of protein for growing horses. It does not keep the digestive apparatus in good working order, and is the cause of poor condition and stunted growth in many cases. Exercise during the winter is a necessity.

To pasture through the summer is not only a cheap but highly efficient method of developing young horses. During the early part of the season, while the grass is good, no grain will be necessary, but when the dry and sparse pastures of August and September come on horses should have grain. Oats and corn, one-half each, on bluegrass or clover and timothy pasture, keeps up their health and thrift. At this season of the year a shed in which the horses may seek protection from the sun and flies is a material advantage.

In short, both through winter and summer growing horses should have plenty of good food, water and exercise to produce the maximum development.

WORK HORSES.

Work horses on the average farm are for the greater part brood mares. The care and management of this class of horses has been previously discussed, so need not be mentioned here. The animals which deserve attention in this connection are the horses not used for breeding purposes and mules. Economy is a great factor in caring for these animals, and should be considered carefully so long as it does not interfere with their working capacity or health.

The kind and amount of work to be performed will have considerable weight in fixing the ration to be fed. During the summer, which is the season of hardest work on the farm, a ration of the highest possible efficiency is practical. It should consist of a comparatively large proportion of concentrates. For horses doing farm work corn and oats, half and half, is an efficient grain ration when fed with timothy and clover used as a roughage. Corn and bran, one-half each, gives good results, and may be used when oats are not available. Alfalfa in limited quantity may be fed to horses doing ordinary farm work, but should be fed in connection with timothy. For light horses doing road work corn must be fed in very limited quantities. Roadsters and drivers do very well on a ration of five parts oats, one part bran, and timothy hay. The proportion of hay fed should be comparatively small.

During the winter when there is not much work to be done about the farm, the ration for work horses may be materially decreased. "Roughing" horses through the winter has come to be a common practice. To be kept through the winter in this way horses should be given a shed for shelter, preferably one opening to the south. As a feed it was found at the Utah Experiment Station that alfalfa alone was sufficient for maintenance. Well cured clover hay with some corn fodder (stalk and ears) may be used, but a small amount of grain is advisable. Timothy hay, and corn stover is not a satisfactory ration for "roughing" horses through the winter. They need more protein, which may well be supplied in the form of some leguminous crop. Horses that have been treated in this way should be given grain and exercise at least six weeks before being put to work.

SWINE FEEDING.

(C. A. Willson, Instructor in Animal Husbandry, Missouri Agricultural College.)

That swine occupy such an important position in the livestock industry in the State of Missouri is not to be wondered at when we consider that it is ranked as one of the first states in the Union in the production of corn, nearly one-tenth of the world's supply being grown here. In 1906 Iowa ranked first, with 373,275,000 bushels; Illinois second, with 347,169,585 bushels; Nebraska third, with 249,782,500 bushels, and Missouri fourth, with 228,522,500 bushels; but as a feeding State, figuring upon the basis of the number of bushels fed up to March 1, 1907, we find that for the winter 1906-7 Missouri leads all other states of the Union, having fed 100,549,900 bushels of the home-grown crop. At the same time Missouri marketed 3,621,779 head of hogs that it is estimated consumed at least 18,108,895 bushels of corn. The question, then, that concerns us most is, "Was it fed most wisely, or might it have been fed in such a way as to have saved a 1,000,000 bushels of it, making a saving of $400,000? Or, in other words, has the highest possible price been obtained for the feed fed? Have the most economical gains been made?"

The prices received for the feeds fed depend entirely upon the methods of caring for and feeding the animals. As to the class of animals there is no class of domestic animals that will make such quick profits as will hogs. There is no other domestic animal that can increase its own weight by 150 times in six to eight months. No domestic animal that will dress such a high percentage of dressed weight; no domestic animal that will manufacture more meat for a given amount of food. Cattle and sheep will make one-third less amount of meat from a given amount of grain. The hog, then, is the farmer's friend, his mortgage lifter, his home builder, his bank depositor; and the extent of his mission as such depends upon the treatment given him.

I know no formula for producing healthy hogs or for feeding hogs, unless it be the following prescription, which may be designated as "Attention to Details":

Attention to Details.	Observation	40 pts.
	Origination	20 "
	Sanitation	10 "
	Protection	10 "
	Nutrition Q. S.	100 "

Sig. or Dose.—Take 365 days in the year and rub on between times.

This prescription, if given according to directions, is warranted to bring about success.

Attention must be paid to details if one wishes to succeed in the hog business, whether one is catering to the breeder or to the market.

A hog's history begins before he is born, and in order to understand how to grow him to the best advantage we must first look to the care and purity in breeding of his parents. In a large measure the care and the feed of the mother will determine a pig's advantages at birth, his chances for developing into a strong, vigorous hog, capable of manufacturing corn and other grains into pork, his efficiency as a meat manufacturing machine. The factor, then, that will determine in a large measure success, will be the attention to details taken in the origination of our breeding herd. Shall we breed from young or old animals? Shall we breed from grades or purebreds?

While beginning our foundation herd it may be necessary to breed from young and immature animals, yet it should be borne in mind that the strongest and most vigorous young are produced from animals that have reached maturity. Animals that have reached their fullest development do not expend their energies toward their own development at the expense of the offspring, but rather to that of the offspring. The sole purpose of a mature animal in nature is the production of strong, vigorous offspring, and their whole life previous to that time is spent with that end in view. Can we, then, in our breeding operations be successful and yet violate nature's laws by producing swine from young and immature animals? In order to build up strong, vigorous herds the practice of breeding from young boars and gilts cannot be continued. The practice of buying from six to eight months old boars, because they can be bought cheaper, to use upon our herds for two seasons, and then marketing the boar, cannot but meet with disastrous results. If, then, a new boar must be bought, let it be done, but at the same time the old one should not be sold. It costs but little to maintain a boar, and his services in a herd will be worth far more than will those of one young and immature. He should be kept, then, as long as he remains strong and active. In constructive breeding operations it is almost absolutely necessary to keep more than one boar. One of the greatest constructive breeders in the world has no less than eight or ten boars in active service with his herd. The same principle holds true with the sow. The tendency is to discard the aged sow, because of her rough, unkempt appearance, for neat, trim gilts. Let us not be too ready to discard a sow that we know to be a strong, regular breeder, having large litters, for one that is yet untried, but keep her so long as she produces regularly large litters of strong, healthy pigs that approach somewhere near our ideal. The Wisconsin Station found that there is a fairly constant relaton between the weight and number of pigs in a litter to the weight of the sows. They also found that the number of pigs, weight of litters, and average weight of pigs increased as the sows were advanced in age. With stronger, more vigorous pigs at birth more rapid and more economical gains can reasonably be expected.

As to whether purebreds, grades or scrubs shall be grown rests largely with the aesthetic tastes of the producer. Crossbreds and scrubs may make as economical gains as high grades or purebreds, but as yet it has not been conclusively proven that they will make any more or any less rapid gains. But this is known that the hogs that command the highest price on the market are those that have the conformation of the purebreds, and that uniformity that is only present with high grades or purebreds. There is nothing

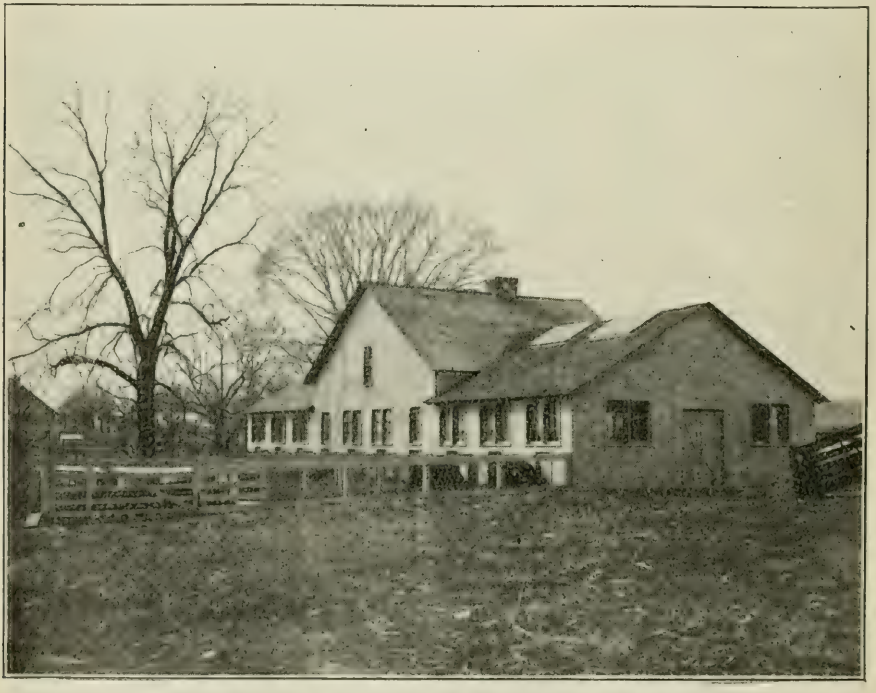


Fig. 1. Missouri Experiment Station hog house.

that appeals more quickly to the buyer than that of evenness in characteristics and excellency of conformation. Aside from this there is nothing more gratifying to the feeder than to have about him hogs that show some care in selection and breeding.

Much depends upon the selections made of individuals that make up our breeding herd. After having decided upon the breed that appeals to our own personal tastes and is most suited to local conditions, then we should choose a boar to head that herd that would have the following general characteristics: First, and above all, he must show strongly the breed characteristics of the breed of which he is a representative. Then he must show strong masculine characteristics. He must show masculinity in the head—not be too finely featured—wide between the eyes, and not fine in the snout nor the jowl. The head, neck and shoulders should blend well. The neck should be short with some crest and thickness; the shoulders should be smooth and compact on top, deep and wide between the legs, and blend well with a large, full heart girth. We should be disappointed if there were no indications of shield on the boar, thus showing a lack of masculinity, but we do not want thick, heavy shoulders. The body should be long, smooth, evenly fleshed, with a slight arch of good depth and with a wide, strong loin. The hind quarters should be long, deep and wide, well let down in the ham, and having a width equal to that of the shoulders and body. Supporting all this should be four short legs, showing good, strong bone of a fine quality, having short pasterns, and standing well on the toes. The covering of hair should be abundant and of medium quality. He should be active, not sluggish, yet docile, and of a quiet disposition. With these characteristics are usually found active digestion and an inclination to take on flesh readily.

The sow should possess essentially all the characteristics of the boar, except that she should show refinement in those characteristics that indicate femininity. The body should be long, showing great digestive capacity and room for carrying young, and with twelve to fourteen evenly sized teats. The hind quarters always should be broad to obviate difficulty in parturition. There should always be a good width between the eyes, for narrowness in the head indicates meanness of disposition, difficulty in managing, and nervous, restless pigs. So much regarding origination or breeding, but we notice in our formula for success in the hog business that equal importance has been placed upon nutrition as compared with origination—equal stress upon nutrition or feeding as compared with breeding.

In the case of the boar the objects to be sought are those of strength, vigorousness, activity and healthiness, and therefore our energies in the care of the boar must be guided in that direction. Then shall nitrogenous or non-nitrogenous feeds be fed? Shall he be kept thin in flesh or very fleshy? The answer given to the first question should depend upon the age of the animal. A boar that has not yet reached maturity will require a narrower ration than the one that has, for the reason that he is building up his vital organs, muscles and bones (parts built up largely of nitrogenous or proteid material), while the mature hog is but maintaining his. The mature boar should carry a sufficient amount of flesh to insure a thrifty, healthy appearance. An over-abundant amount of flesh is not conducive to exercise, and consequently places the boar in an inactive condition, and a somewhat less active condition of the cells themselves. Exercise is the prime essential with the boar.

To induce exercise, he should be given plenty of range with an abundance of pasturage. If his lot be divided so that forage crops of rape and cowpeas or alfalfa may be given, then along with this pasturage but little grain need be given. The nature of the grain ration of the mature boar will depend upon the nature of the pasture. If he is being pastured on a proteid pasture his ration should be balanced with a small amount of corn, a pound or two per day, with possibly a small amount of bran or middlings slop. At the time of the breeding season the ration should be increased so that he will be gaining in flesh. The reason for this is that it has been found if the boar and sow are gaining in flesh at this time that they are in a perfect healthy condition, and that they are producing a greater number of reproductive cells that are more active and strong than in hogs that are simply on a maintenance ration. These cells, then, being of a greater number and more vigorous, there will be large, even litters of pigs.

For winter feeding again the boar should not be confined to too small a yard, and if he refuses to take exercise he should be induced to take it either by driving him about or by making the distance between the sleeping and eating quarters greater. Let his ration be balanced to about 1:5 or 6, and consist of corn, bran, alfalfa meal or hay, and shorts. Barley and wheat are also good feeds. Make his ration rather bulky. The addition of a few roots, 1 or 2 mangles per day, make a very good appetizer, and help to regulate the bowels.

The case of the sow while farrow and at the breeding season is essentially the same as that given for the boar, except that, owing to the fact that she is more easily governed, she may be allowed even a greater range. If she is in good condition at the time the pasture season opens and has abundant forage she will need but little, if any, grain. Good forage with hogs is just about equal to a maintenance ration, and even fair gains are recorded for alfalfa pasture. At the North Platte Sub-station in Nebraska it was found that sows weighing 200 pounds each gained .43 pounds per day for sixty-three days on alfalfa pasture and no grain. If one has no alfalfa, forage may be provided by using some of the following: Rape alone makes a very good forage crop but does not withstand dry weather very well, and therefore may be alternated with lots sown to the following mixture: Rape 2 pounds, cane or corn 20 pounds, cowpeas 8 pounds, or this mixture may be varied by the addition of oats or barley, if sown early. Rape, when fed with corn, has been found to be worth $18 to $20 per acre. A very good method, if there are several lots to sow, is to plow them all, and then fit and sow a lot each successive week; by so doing one will have a fresh lot of green forage for several weeks to turn into. Do not pasture rape or alfalfa too closely, and it will rapidly recuperate, thus furnishing a fresh crop of forage. If the rape becomes lousy, the ravages of the little pest may be checked by pasturing off quickly. If alfalfa is the forage crop, only such a number of hogs should be turned on as will allow a portion of the first cutting of hay to be cut while the hogs are yet being pastured upon it. From succotash mixtures of forage the Michigan Station found that 11.44 tons of green forage could be produced from an acre. If bluegrass is used for pasture and the season is dry, it may be found that it will not maintain sows in normal flesh, and in addition a pound to a pound and a half grain—corn and middlings—may have to be given. Upon the whole, the principles to be kept in mind in the care of the sow are that she be given plenty of exercise and not too concentrated foods, and that at the time of breeding she should be in fair flesh and increasing in weight. She should be bred to farrow in March or the fore part of April.

During the winter, if there be but a small number of sows, a very good plan is to let them have the run of the cattle yards, and sleep in hog cots, if the yards are not too crowded; and if the cattle are running loose, the sows should be taken out at least six weeks before farrowing time to prevent injury. Aside from the food they may gather in yards, they should be given drink regularly, a little corn and middlings, the amount depending upon the amount of food gathered by them, and a couple of roots per day. Sows may be wintered very cheaply in this manner, and forced to take a great deal of exercise. After removing them from the yards just previous to farrowing time give them laxative foods. The demand upon the sow for the latter half of the period of gestation are great. If the food is of the right nature there is but little danger from over-feeding; the danger is more often from underfeeding. Sows are more often under-fed than over-fed. The ration should not consist of too much carbohydrates or fat-building materials, but should be properly balanced with proteid feeds of a bulky nature.

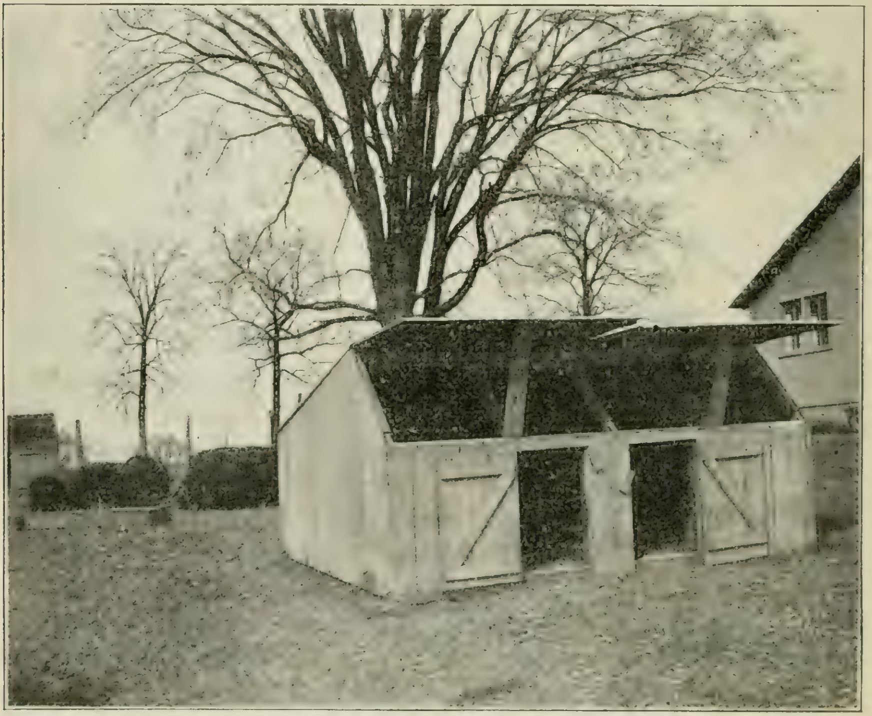


Fig. 2. Hog cot used by Missouri Experiment Station.

If the brood sows be too great in number to permit of the plan suggested select a site for wintering them that is dry, with good drainage, and use the hog cot system. This system will necessitate the feeding of more grain. Give a ration of corn 3 parts, shorts 3 parts, oilmeal or tankage 1 part, and also some alfalfa meal or hay. Of the grain ration, feed on the average about 3½ pounds per day. If the sows have been summered on alfalfa the previous summer one will be surprised at the amount of alfalfa hay, preferably third to fifth cutting, that they will eat if it is kept clean by using a rack that is adapted to their purposes. The cost of this method of wintering will be from 2 to 4 cents per sow daily.

At time of farrowing the sow should have been used to the farrowing quarters for at least two or three days previous. This pen should have preferably a hard, smooth clay floor with a bushel or two of fine chaff for a bed, but if this is not possible, the next best floor is a pine floor. Cement should never be used, because it conducts heat away so rapidly as to chill the newly born pig. In any case there should be a projecting rail around the pen six inches from the wall and five or six inches from the floor, under which the little pigs may be crowded and not smothered when the mother lies close to the wall. Provided there is no difficulty the sow is best let alone and not disturbed.

After farrowing, while yet in a fevered condition, the sow should be fed but little feed, and that of a laxative, cooling nature. The drink should have the chill removed. For food, give a little milk with a handful of middlings. She does not require much feed, as the demands upon her are but little, and one should not be too anxious to get her on full feed. The rations should be increased from this amount very slowly and from a week to ten days taken to get on full feed.

From now on all our energies are applied directly toward growing the pig and then marketing him. We are to see direct results from all our thoughtfulness of afore. We planned for large litters, because we believed that prolific dams would transmit some of their vitality to their offspring, and we would have more thrifty and better feeders than those from small litters. Now we have them, and upon the first three months' care and feeding depends our future success. Give a ration of corn 1 part, shorts 1 part, and bran 1 part, for full feed, equal in weight to four or five percent of the weight of a mature sow in fair condition. A ration of this sort, with plenty of sunshine and exercise, will never produce pigs with the thumps or scours. If bran and shorts are too high in price, the corn may be balanced up with oilmeal or tankage 2 parts, corn 8 parts, and alfalfa meal 2 parts. At about three weeks of age the pigs will begin to eat a little from the trough, and should then be provided with a creep. By having a creep for the pigs, feed especially suited for them can be kept quite constantly before them and utilized by them to a much better advantage than by gorging the sow. Place within the enclosure a low, flat-bottomed trough and in it a thin slop made by stirring in the milk, corn 2 parts and shorts 3 parts. Feed about what they will clean up from one feed to the next. Do not force a pig to eat out of a high trough, for this has a tendency to produce a weak and sway back. The most suitable time for castrating the male pigs is at five to six weeks old, while they are still receiving nourishment from the dam. The pig can be most easily handled at this time, and they more quickly recover from the operation.

At seven to nine weeks of age the pigs should be weaned. This can be accomplished to the best advantage to the pigs and their dam by weaning first the stronger pigs of the litter and leaving the weaker ones with the mother. This will make the entire litter more even in size and at the same time be a more gradual way of drying off the sow, and thus prevent damaged udders. In weaning the pigs it is much better to have the sow and pigs in the pasture or feed lot where it is desired to have the pigs run, at least a week before the time of weaning, and then wean the sow away from the pigs, and not the pigs away from the sow. They will worry less. Remove the sow and two or three of her smaller pigs to a lot out of sight and hearing of the pigs being weaned. The time of weaning is best at seven to nine weeks, because the pigs will be eating very freely from their trough in the creep, and the flow of milk from the sow will have been quite materially diminished. The Wisconsin Station determined by weighing the pigs on certain days of each week before and after suckling the amount of milk given by a sow. They found that there was "a marked falling off in the amount of milk given by all the sows from the fourth to the eighth week, the average daily yield for each sow at the fourth week being 6.23 pounds, and at the eighth week 3.85 pounds, a difference of 2.38 pounds daily, or a falling off of 38 per cent. in four weeks."

It was also shown that a hundred pounds gain could be put on more cheaply previous to weaning time than at any other period of the pig's life. During the first four weeks the cost of a hundred pounds gain was $1.23, and during the second four weeks the cost was $1.75, or an increase of 42 per cent. over the cost for gain during the first period. The third four-week period it was $2.18, the fourth $2.78, and the fifth $3.38, thus showing that so long as the pig is suckling, and his stomach is not yet adapted for bulky foods, we had best make use of this period for making very profitable gains for feed fed.

After weaning, the methods of feeding and caring for the growing pig will depend upon the purpose for which he is to be used, but up to this time the method should be essentially the same in all cases. The method of handling the pig now will depend upon whether or not he is to be developed for breeding purposes or for market, and if for market, whether or not by a long or a short feeding period.

If for breeding purposes, then, the pig should be fed to develop bone, muscle and vital organs, and to do this the ration should be largely of proteid feeds. Professor Henry found that hogs fed on a protein-rich ration shrank in dressing 21.7 per cent., as against 20.7 per cent. in the case of hogs fed a ration poorer in protein, the difference being due to the favorable development of vital organs in the hog fed the protein-rich ration. The weights of the blood and of the internal organs in the case of the hogs receiving an excess of protein were, blood, 53 ounces; liver, 40 ounces; kidneys, 6.5 ounces; while in the case of the hogs receiving an excess of carbo-hydrates the weights were, respectively, 39.5 ounces, 30 ounces, and 4.7 ounces. The breaking strength of the thigh bones stood in the ratio of 430 to 356. The conclusion, then, is that breed-

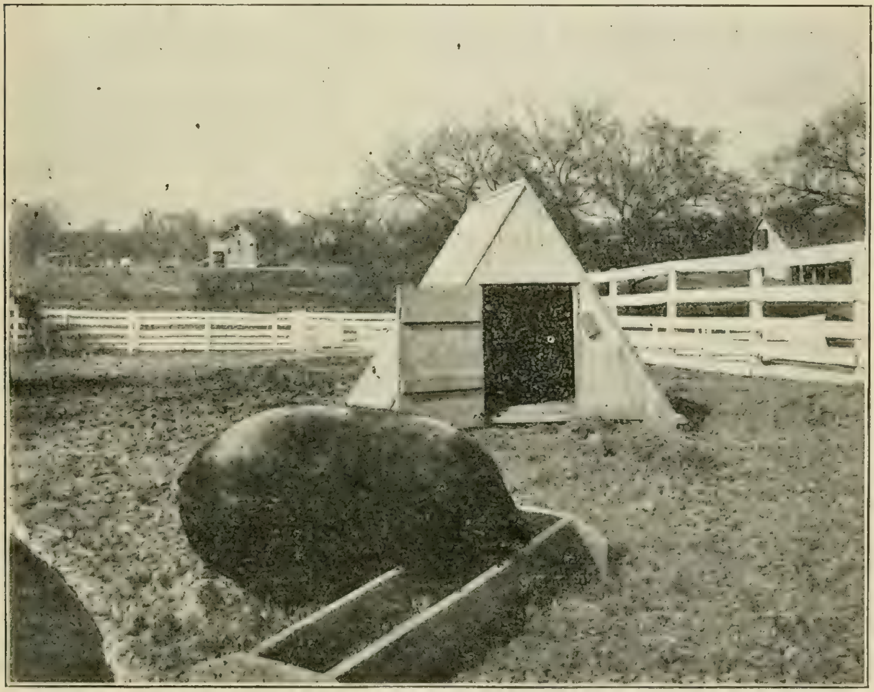


Fig. 3. An "A" individual hog cot used by Missouri Experiment Station.

ing hogs should have a protein-rich feed, in order to develop the vital organs to the greatest possible extent, by feeding.

As to long or short periods for growing and finishing the market hog, both systems are followed by successful farmers in Missouri. For the short period, the March and April pig is grown rapidly and marketed in six to ten months of age; while the long period pig is grown through the summer and winter, and marketed the following spring or fall. As to which method is the most profitable may depend upon local conditions, feeds, condition of hogs at marketing, and price obtained. Under ordinary conditions, I believe the short feeding period or marketing at six to ten months of age to be the more profitable. It costs, according to work done by the Wyoming Experiment Station, to maintain a sow on as cheap feed as alfalfa hay and beets, 2.7 cents per day. We may reason, then, that for maintenance alone it will cost from 2 to 3 cents per day for pigs, then, every day cut off by finishing at an early age, means doing away with this added expense. We also note from the data already given that the cost of producing a pound of gain increased as the pig advanced in age. The risk in growing the pig for a longer period is also greater. No one can expect to maintain a very large number of pigs until 12 to 18 months of age without some loss, and in case of hog cholera breaking out in the neighborhood, the shorter fed more nearly matured hogs will be more nearly ready for the market, and can be disposed of immediately. It is true that the pigs of the other class can also be sold on the market, but at a decided disadvantage as compared with the former.

In farmers' bulletin No. 172, W. J. Spillman gives an account of a method of farm management, in which no hog is marketed under one year of age. The system is essentially as follows: The sows farrow once a year—fore part of April—and are given, along with their litters, clover forage, supplemented with 3 pounds of corn per sow and litter, which is increased until they are receiving 17 pounds by fall, when the pigs have reached a weight of 100 to 125 pounds. During the winter the pigs are fed soy bean hay, and an average of about five pounds of grain per day, reaching a weight of 200 to 225 pounds each by spring. As soon as the clover pasture is available in the spring, they are pastured and received in addition 2½ pounds gain daily in the beginning, to four pounds at August 1st, when they have reached the weight of 325 to 350 pounds, and are ready for the market.

This seems about as good a feeding system as one could devise, and yet upon closer inspection, it would seem that the profits do not warrant the greater risk and cost of handling. Taking him at his own figures, and dividing his feeding periods—summer, winter, and second summer—as follows: Summer, April 15th to November 1st; winter, November 1st to June 1st; second summer, June 1st to August 1st, we find that his expense of producing a 338-pound hog as follows:

April 15th to November 1st,	241 pounds corn, + clover pasture.
November 1st to June 1st,	*1,260 pounds corn, + soy bean hay.
June 1st to August 1st,	195 pounds corn, + clover pasture.
Total................	1,696 pounds corn.

This makes a total of corn fed 1,696 pounds, or 30.3 bushels, which, at the conservative price of 40 cents per bushel, would make the cost of corn alone $12.12. At 5 cents per pound his finished hog is worth $16.90. This would leave a margin of $4.78 to pay for clover pasture, soy bean hay, care of dam for fall and winter, cost of caring for the hog, and insurance for the greater risk in growing the hog for a longer time. In comparison with this, let us look at some results obtained by the Wisconsin Experiment Station in 1903 in determining the "food requirements of pigs from birth to maturity"—maturity being at eight months.

TABLE.

Average net gain of each pig and average cost of feed for 100 pounds gain from birth to maturity. (Wisconsin Experiment Station):

	Av. net gain per pig. lbs.	Av. cost of feed per 100 lbs. net gain.
First 4 weeks..........	8.8	$1 17
Second 4 weeks..........	12.6	1 71
Third 4 weeks..........	21.4	2 06
Fourth 4 weeks.	20.0	2 74
Fifth 4 weeks	23.3	3 34
Sixth 4 weeks..........	29.1	3 19
Seventh 4 weeks	29.3	3 95
Eighth 4 weeks..........	32.4	4 20
Average..........	176.9	$2.80

Note that cost of gain increases with the age of the animal.

These figures also show the actual cost of feed for 100 pounds gain, for the pigs received no pasture.

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*Figured on the basis that this 5 pound grain mixture was equal to 6 pounds corn.

In this experiment the cost of feed in producing 338 pounds of live weight of pork would be $9.46, which, selling at 5 cents per pound, would leave $7.44 for profit, and for caring for the hogs.

However favorable these facts seem for maturing hogs early, if one has good clover for forage and can market the pigs in the fall as feeders at a price equal to or above market top prices, there is no doubt but the system will be profitable. Gains on clovers, where a small amount of grain is fed, can be made very cheaply. The Wisconsin Experiment Station found that pigs on clover pasture, with one-fourth of a full feed of corn, required 243 pounds of corn for 100 pounds of gain, while pigs on clover pasture with a full feed of corn required 417 pounds of corn for 100 pounds of gain. It then follows that a long feeding period may be the most profitable, when corn is high and one has considerable bulky feed in the way of alfalfa pasture, clover or rape, and wishes the pigs to follow after fattening steers. In comparing grain-fed hogs that were confined in pens with hogs following steers, and receiving a small amount of grain in addition, the Mississippi Experiment Station found that the cost per pound in each case was for the pen lot 4.88 cents, and for the second lot, exclusive of the waste from the steers, was 1.15 cents.

When corn was relatively low, the Nebraska Experiment Station found that the liberal use of grain on alfalfa pasture was most economical. This experiment was with four lots of pigs, ten in each lot, to which corn was given in varying amounts. At the time of the experiment corn was worth 30 cents a bushel, and the alfalfa pasture was valued at $5.00 per acre. However, had the alfalfa been higher, the results would have been more marked. The results were as follows:

TABLE. (NEBRASKA STATION.)

	Lot 1. No. Grain lbs.	Lot 2. Light Grain Ration.	Lot 3. Medium Grain Ration	Lot 4. Heavy Grain Ration
Average weight of pigs, August 27	74.0	73.5	73.5	72.5
Average weight of pigs, October 27	75.4	95.2	113 3	126.2
Average gain from August 27, to Oct. 27	1.4	21.7	39 8	53.7
Daily gain per pig	.02	.34	.63	.85
Average amount of corn consumed by each pig per day	....	1.33	2.48	3.46
Corn consumed per pound, gain	....	3.86	3.98	4.23
Cost of corn per 100 lbs. gain	....	$2.08	$2.15	$2.28
Cost of pasture per 100 lbs gain	$14.30	0.66	0.30	0.15
Total cost per 100 lbs. gain	14.30	2.74	2.45	2.43

Notice from the above table that alfalfa, when fed alone, is about equal to a maintenance ration, but where grain is fed with it the gains are made at a very moderate cost. Large brood sows will do well on alfalfa alone, but the stomach of the pig is not capable of digesting large amounts of bulky food.

Forage crops, as has already been shown, lessen the cost of gains, thus making spring litters more profitable than fall litters; however, by abundant and careful feeding, the sow should produce two litters a year. The ration for the fall litter should be made as nutritious and as palatable as possible. Feed corn, balanced with shorts, gluten feed, linseed meal and milk. Skim milk for the first few weeks, in getting the pigs started right, may be worth 25 to 30 cents per hundred pounds. If a pig is stunted on the start, he will always remain so. Give them plenty of sunshine, warm, sunny yards, plenty of exercise, and freshly bedded, dry sleeping quarters, and, then, with not too much corn in the ration of the pig there will be no trouble with the thumps or scours. If the pig is to be reared for breeding purposes, then his food should always be of quite a high protein content.

At fattening time, when the pig is to be crowded, and finished for the market, corn is indispensable, but should never make up the entire ration. The protein feeds that may supplement corn are middlings, oilmeal, tankage, and bloodmeal, depending upon the prices of these feeds. These fed, with corn in amounts to balance the ration, will always produce better gains and cheapen the cost of production.

The feeding period should not extend over a space of time longer than six weeks, during which time the hog should consume a ration equal in weight in the beginning of the fattening period to 4½ per cent. of his own weight to 3 per cent. of his weight at finishing. The weight at finishing should be from 250 to 325 pounds. This weight has topped the market in Kansas City for eleven of the last twelve years.

The general health of the hogs depends most largely upon judicious, regular feeding and good sanitation. If these are given, along with plenty of charcoal, salt, and ashes, a general unthriftiness among our hogs need never be feared. As to condimental or the so-called "stock foods," it is never profitable to buy them. The prices paid are all out of proportion to their food value, and while they may increase the number of pounds gain, they also increase the cost of that pound of gain. If grain ration needs balancing with a food of high protein content, then it may be provided in oilmeal, tankage or bloodmeal. If hogs need medicine or a condition powder, one can compound it much cheaper than the stock food company, and besides, one will not have to pay for advertising. A very good condition powder is the "government hog remedy," which is compounded as follows:

Wood charcoal	1	pound
Sulphur	1	"
Sodium chloride (common salt)	2	"
Sodium bicarbonate (baking soda)	2	"
Sodium hyposulphate	2	"
Sodium sulphate	1	"
Antimony sulphide (black antimony)	1	"

Dose: Large tablespoonful once a day for each 200 pounds live weight. Mix well with the feed, and feed in the form of slop.

This remedy is very good for dispelling worms, and is also a good digestion corrector. Another very good and cheap condition powder, that can be used more generally, is the following:

Ashes	10	pounds
Salt	1	pound
Sulphur	8	ounces
Lime	2	pounds
Copperas	1	ounce
Charcoal	3	pounds

Pulverize and mix thoroughly. Keep in a box where the hogs can have constant access to it, or give small amounts along with the feed.

Hogs seem to have a craving for ashes and charcoal, due to the lack of the proper amount of mineral ash in the usual ration that is fed them, and it can be very cheaply supplied in this way. Professor Henry found in an experiment conducted by himself that it required 629 pounds of corn meal to make 100 pounds gain when ashes were not fed, as compared with 491 pounds when they were fed. A mixture of charcoal, ashes, salt, and sulphur should always be kept where the hog may have access to it.

A constant guard should always be kept against vermin, as it costs more to feed mange and lice than it does hogs. For mange, use equal parts of sulphur and lard, with just enough kerosene to make into a paste.

For lice in the winter, nothing is better than just ordinary keronsene squirted with a small can along the back and behind the ears. Crude oil is also good. If used in the spring or summer, the hogs should be kept out from the sun for a day or two, to prevent blistering. The much better practice for summer is to dip the herd every month. Dipping will also help to keep the hogs in a clean, healthy condition.

A running stream is very good for hogs, but filthy mudholes should not be tolerated.

The ideal herdsman is gentle in manner, and moves quietly among the herd. He is quick to observe, in fact, loves to observe and watch the animals in his care. He loves to watch them as they eat, and note the gains they are making.

The man who succeeds best with hogs is the man who "observes," keeps well-bred hogs, is on constant guard against disease and vermin, through good sanitation, has ample "protection" against cold of winter and heat of summer, and gives properly balanced amounts of "nutrition"—or, to be short, is the man who pays "attention to details."

PEDIGREE.

By W. P. Harned, of Vermont, Missouri).

Last year, at our annual meeting of the Improved Live Stock Breeders' Association here, we had quite a lively discussion on this very subject. It was opened by Mr. Miller of Indiana, an exporter of high-class stock to South America—especially cattle, and mostly of the Shorthorn breed. Quite a number of breeders took a hand in the discussion, and it waxed rather warm, especially when one went to show the evil that is resulting from inbreeding, or, as some will say, *line* breeding. Touching this phase of the subject, is stepping on the toes of the Fadist. The disciple of fads is very tender at this point.

It was the intention of each speaker in that discussion to show the good use we are to make of a pedigree. But most of the debaters brought out so strongly the abuse to which many breeders are subjecting our pedigrees, that it almost appeared in the wind-up that pedigree is a bad thing to be attached to our animals. What they really meant to explain was the kind of a pedigree that is valuable and a good guide in our breeding operations, and the kind, on the other hand, that is dangerous, and should be avoided, even though it may be approved by the fickle hand of fashion. It was very fortunate Col. W. A. Harris happened to be present at that discussion, and later, in one of his forceful speeches, he, at least, set right some of the ideas which it seemed were wrongly conveyed to the audience.

In our live stock vocabulary, I believe, there is no more important word than pedigree, and I also believe there is none so poorly understood.

It should always be borne in mind that a pedigree is simply a record of the ancestors. An animal has no pedigree when there is no record of the ancestors. A good pedigree should mean nothing more nor less than a record of good ancestors. Yet, this does not always mean a fashionable one. A bad pedigree is a record of ancestors that did not possess real merit. A fashionable pedigree today is one whose remote ancestors have sold for fabulous prices. When possible, they are kept fashionable by the speculator, who hopes to stimulate a boom on past glory, and reap a harvest by deceiving some over-enthusiastic youth, or blinding the unwary. I once heard a high authority say, in speaking of the late Shorthorn fads, that if the leading breeders are to continue their misguided family craze, it would be a blessing if the herd books were made into a grand bonfire. I do not believe that he was far from the true mark, though some thought it a rather strong statement.

It has been said nothing is so dangerous as popularity, and this applies with double force to the popular pedigree. When a family of live stock becomes *very* popular, even the weeds in that family will be used as herd headers. A pedigree weed is an abomination. A line-bred weed is even worse. Any line-bred weed is very impressive to the offspring. Being intensively bred, the bad qualities are only the more strongly transmitted; and the very popularity of such a family is sure to work its own destruction. Families are valuable only for the merit they possess today, not for the merit their ancestors possessed fifty years ago.

PEDIGREE IS OUR GUIDE.

A record of the ancestors of both the male and the female is the best guide we have to instruct us in the mating of our domestic animals. While the produce will inherit the qualities of both the sire and the dam, it will also partake of the qualities of grandsire and granddam to a less degree, and great grandsire and great grand dam to a still less degree, and so on, to very remote blood relations. If we are real breeders and true moulders of form and quality, this is our only guide, and present day fashion adds not one whit to successfully evolving any type or quality we may have in view. Even in this progressive age, there is no text-book for breeding our live stock. No rule is yet laid down that will tell us what the mating of two animals will produce. We can only foretell that by the appearance of the parents and weighing up what the ancestors have been. Each breeder is unique and works out his own plans without book or rules. His work must be even more original than the sculptor or artist, for the latter, at least, has a model before his eyes. The breeder evolves a type not seen, and produces it from live flesh and blood.

This is the work of the real breeders, aided by pedigree or a knowledge of the ancestors.

Thus far a pedigree is good, but there is also an abuse of it.

The Shorthorn men abused their pedigrees years ago—I am glad to say years ago—they are not so bad now; yet not entirely free from fads. They inbred one family of cattle until that family was a disgrace to the breed. Originally it was the best on earth. I believe the Angus men are partly guilty of the same folly now with their Blackbirds, Ericas, Queen Mothers, etc. And now a Poland China breeder comes out in bold print and declares if the breeders of that race do not use more sense and less fads, they will only add proof to the maxim—"Our popularity ruined us."

DISCUSSION.

Mr. Gentry—I think that paper is a very good one. I think that most of us, in discussing pedigree, forget something that is fully as important and even more so probably. I don't care what your pedigree is, or the individual that you start with, you are not a success in developing the young animals properly, if you are not a liberal feeder—an intelligent feeder. All breeders who have made any record at all, and who have produced anything worth showing, have been men who are *liberal* feeders. I find that the average man, starting in the stock business, will overlook this important thing—liberal feeding. I don't care what your ancestry is, when the animal is born you simply have a foundation on which to build, and if you don't build right, you don't have a good animal. But a person can be a liberal feeder, and not feed *intelligently;* not feed a balanced ration, in which case the animal will not be developed properly. If anything, development is worth more than pedigree. I have seen breeders take inferior stock to start with and wind up in a few years with stock that is worth noticing, and that pays much better than to start with a much better stock, and give it poor handling, poor feed and poor care. Some men *know* what is best to do but they don't like to get out in the cold and snow after dark to look after the comfort of the animals. There is as much in that as there is in the feed. The natural law is the "survival of the fittest:" The man who works faithfully deserves credit and success, while the man who won't work, of course, deserves to go down in failure.

Mr. Kitchen: I heartily agree with Mr. Harned in what he says about the Angus men being guilty of abusing Blackbirds and Queen Mothers; and it calls to mind an incident up in my county of a Virginian who was six to seven feet tall, and the most ungainly creature I ever saw (however, he was anything but a fool). A professional horse trader was trying to sell him a horse. The horse trader told him all about the good qualities of the ancestors back of that horse, their good disposition, and all. (The animal, in question, was a little bit of a knock-kneed, bow-legged creature.) The Virginian listened patiently as long as he could; then he said, "Now, that's enough of that. I don't want to hear any more. I have got a good pedigree, but *look at my form!*"

Mr. Kidd—As one who attended this convention last year, I want to express my appreciation of Mr. Harned's paper. Last year we had quite a discussion of this subject, and everybody was trying to reach the same point, and Mr. Harned has clearly brought out what we were trying to get at last year, and I think the paper ought to be commended.

Prof. Mumford—Mr. Harned called attention to one fact, which it seems to me, is important: The value of an animal does not depend primarily upon the good points of an animal that lived 50 or 60 or 75 years ago. All of our breeding indicates that the most essential thing in the pedigree of an animal is that the *immediate* ancestor of that animal be good, rather than the ancestor that lived twenty centuries back. If there is one criticism that can be placed against the breeders of improved live stock at the present time, especially in the cattle trade, it is that of selling cattle upon the basis of the good qualities that existed in ancestors that were produced 20 or 30 centuries back. We want to know the qualities and characteristics of the ancestors that existed in the last four or five generations.

FARM MANAGEMENT.

THE RELATION OF ANIMAL HUSBANDRY TO FARM ECONOMY.

(Frederick B. Mumford, Professor of Animal Husbandry, University of Missouri.)

A permanently prosperous agriculture is impossible without the large use of domestic animals. The greatest single factor in agriculture as a profitable occupation is the productiveness of the soil. The profitable production of any crop continually on the same area is impossible. At the great Rothamstead Experiment Station in England the continuous production of wheat on the same land for a half century resulted in an average of 13 1-10 bushels per acre. This yield was too small to pay the cost of production and the fixed charges on the land, and then leave a profit. On the same kind of land the application of farm-yard manure resulted in an average yield of 35.7 bushels of wheat per acre for a period of fifty-one years.

The statements in this article regarding the profitable production of crops apply only to those systems of farming which are commonly known as general farming, or grain farming. It is not intended that the facts presented in this discussion shall apply to that limited class of agricultural occupations, such as truck farming, floriculture, etc.

The importance of a high degree of soil productiveness in our farming operations cannot be overestimated. In all farming operations there are certain fixed charges which must be met whether the yield is 20 bushels of corn per acre or 60 bushels on the same acre. The cost of plowing, harrowing, planting and cultivating are practically the same, no matter what the yield. The cost of harvesting is less per bushel if the yield be large. We may say that it requires a certain minimum yield of grain to pay the expense of production. This minimum cost will be about the same, whether the yield is large or small. The excess above this so-called maintenance requirement will represent profit. It is possible for a man to farm land which is so poor that 1,000 acres of it may be required to net him a profit of $1,000. It is equally true that a fertile farm of 160 acres may be so productive as to net its owner $1,000. It is, therefore, not an idle statement that the fertility of the land is the greatest single factor in agriculture.

In the important investigations which have been conducted in recent years on practical methods of maintaining and improving soil fertility, one of the most significant results has been the increasing importance which has been given to the use of farmyard manure. The investigations of Hopkins of Illinois, Thorne of Ohio, and of Miller of Missouri, all agree in the conclusion that farmyard manure must now and hereafter be the main reliance of the American farmer in keeping up and improving the productiveness of his soil. Dr. Hopkins says, "farm manure always has been and, without doubt, always will be, the principal material used in maintaining the fertility of the soil." Director Thorne, as a result of twenty years of careful experimentation with commercial fertilizers and farm manure, concludes that "it is possible to bring up the rate of production of a run-down soil to a point exceeding that of its virgin condition, by the intelligent use of commercial fertilizers, but the same results may be obtained more certainly, and at a very much smaller cost, by the production and well-informed use of animal manure."

What is the actual practical value of a ton of farmyard manure produced on the average farm? In asking this question, I am not asking for the chemist's theoretical value, as compared with commercial fertilizers, but the actual cash returns in bushels of corn or wheat resulting from the application of a ton of the average manure produced on an average farm.

There are two methods of estimating farm manure values. The first one is the chemist's method, and may not be the correct statement of the actual cash value of this material to the average farmer. The other, and by far the more practical method of determining manure values, is by actually applying the manure to an acre of land, and compare the increased yield with that on the same land untreated. This latter method has been employed by the Ohio Experiment Station through a period of eighteen years. The results secured by this station are of inestimable value to the farmers of the middle west, and the facts revealed are applicable to our Missouri conditions.

As a result of eighteen years' careful experiment the Ohio Experiment Station has determined that the value of a ton of farmyard manure from cattle, registered in the cash value of increased crops produced, is $2.27 per ton. The same station has also determined, by careful experiment, that the manure produced by a thousand-pound steer during a six months feeding period will amount to three and a half tons, which, at $2.27 per ton, is worth $7.95.

A wise farm economy requires that every bushel of grain and every pound of hay shall be fed to animals. The resulting manure under good methods of farm management will return 80 per cent. of the original fertilizer value of the foods to the soils. The manure thus returned to the land, together with the natural disintegration of the soil and with possibly a small application of mineral fertilizers with a rational rotation of crops, will unquestionably increase the productiveness of 90 per cent. of the soils of the middle west. There is, therefore, ample justification for the feeding of all crops grown on the farm to some kind of farm animals from the standpoint of soil fertility alone.

Animal husbandry, however, is bound to be a controlling factor in modern systems of farm management for other reasons than merely soil fertility. We must continue to use animals as prime motors. There is no immediate prospect of displacing horses by mechanical motors. The horseless age is farther away than ever before in the history of this country. There has never been so large a number of horses per capita in the civilized world as at the present time. The demands for horses were never greater. In the United States the development of horse breeding and the production of good horses on farms has been co-extensive with the development of automobiles and other mechanical motors. The last few years of the 19th century and the opening years of the 20th century have seen the perfection, production and use of thousands of automobiles for pleasure vehicles and for city drayage. It is a significant fact that during this period we have also enjoyed the greatest development of horse breeding operations ever known in this country. In 1850 for every horse or mule on farms in the United States there were 4.8 persons. In 1900 the supply of horses had increased so that there was one horse or mule for every 3.8 persons in this country. It is safe to predict that the time will never come when we can dispense with horse power to any great degree on the farms and in the smaller villages of this country.

The use of animals for food is not recent, but the largely increasing demand for meat products among civilized peoples has created a need for animals and their products unprecedented in the history of the world. According to Hunt, "during the last half of the last century horses and mules have increased two times, neat cattle about three times—milk cows rather less, and other cattle rather more than three times—while sheep and swine have each doubled in numbers in the fifty years. The population in the same period has increased about three and a half times." The demand for these products will continue. The sources of supply cannot now be largely increased. All government areas of free land have been occupied. Japan and China, especially the former, have become intelligent purchasers of our horses, cattle, sheep and swine.

Another very interesting fact in connection with the animal husbandry industry in America in the past half century is that while animals have increased only about three times in numbers they have increased six times in value. This increase in value is partly due to the increased cost of production, but unquestionably the increase is partly due to the remarkable improvement of the specialized characters which have added to the actual efficiency of the animals reared.

The average production of wool in 1850 was 2.4 pounds. In 1900 the average was 6.9 pounds. If it were possible to secure the statistics for dairy cattle we should find equally startling results. Official records of the dairy cows of the present day show that a cow may produce 30,000 pounds of milk and over 1,000 pounds of butter in 365 days. Entire herds of dairy cows are maintained that produce an average of more than 400 pounds of butter in a year. The first trotting race in America, about 80 years ago, was won by a horse that covered the distance in three minutes. The first American fat stock show gave prizes to four-year old steers. No fat stock show in America offers prizes for such animals at the present time. Yearling and two-year old beef cattle of the present day are placed on the market weighing almost as much as the ancient four-year olds of those comparatively recent years.

These significant evidences of marked improvement indicate that the produce on one acre devoted to improved live stock is intrinsicly of greater value now than ever before. It is to associations like the Missouri Live Stock Breeders' Association here assembled that this remarkable improvement has been largely due. You will, however, agree with me that there is as much opportunity for improvement of the average animal during the next twenty-five years as has been achieved during the last three decades. When we consider the very small number of pure-bred sires in use on the farms in the middle west and the relatively low grade of cattle, horses and sheep now produced in many sections of the middle west today, I am sure that you will be confirmed in the belief that there is a great field for associations like this, and for the earnest work of every man interested in the breeding and handling of improved livestock.

But the main reason for raising animals on our farms is that it is a more profitable method of husbandry than selling grain. Laying aside all other considerations it is more profitable to feed the products of our farms to animals than to sell on the open market, and with the improvement of our animals there is no reason why the rearing of live stock should not become increasing profitable.

But we must also remember, in considering the production of animals on the modern farm that a large amount of the material grown on the farm consists of cheap and bulky feed which cannot be readily transported to distant markets, but is available for the rearing and feeding of animals, and the animal thus becomes the condensing machine by which we are enabled to profitably utilize large amounts of otherwise cheap by-products. What, for example, would be the gross value of the increased numbers of animals which might be produced in Missouri alone from the corn stover which is annually wasted on the thousands of acres?

The modern farm must be as much as possible self-sustaining. On the small farm the greatest profit is to be derived from improved conditions of living. Wholesome food the farm must supply, and beef, pork, mutton, milk, butter, poultry and eggs may and should be produced in abundance on every farm. The value of these products in the State of Missouri it is impossible to accurately estimate.

Another ever present condition in modern farm practice which determines our systems of management is the difficulty of securing farm labor. Men have found it possible to cultivate much larger areas if we make large use of domestic animals. One man can administer a much larger farm if this farm is managed exclusively as a stock farm. This is by no means an unimportant advantage, and it is not too much to say that this fact has kept many a man on the ancestral acres who might otherwise have been compelled to rent or sell portions of the farm area.

The rearing and skillful handling of animals requires higher skill and more intelligence and thrift than other methods of farming. This is an advantage from a cultural standpoint. The careful and systematic labor conducted at the right time and in the right way is imperative in successful livestock farming. Much of this labor is worse than useless, unless it is directed by an exact knowledge of what to do and how to do it.

Some of the disadvantages which may be urged against livestock farming, are that the capital required is greater; livestock are subject to disease, and one's entire working capital may perish in a short time; capital in livestock is also bound up for a longer time and cannot be so readily turned into cash.

What of the future? Are the present high prices of animal products to continue? Will the demand for all kinds of animals and animal foods diminish, hold its own, or still further increase? It is impossible to predict the financial conditions of the future. It is, however, perfectly safe to say that never in the history of this country has population and consumption been relatively so large as at the present time. Consumption and the consequent demand for animal products have overtaken the supply, and no matter what temporary economic conditions may obtain in the country, the demand for animal products is certain to continue. The day of free range and of unlimited areas of cheap lands is past. More people live in cities, and hence more people are dependent upon purchased food than ever before. There are, therefore, relatively fewer farmers to supply this need. The vast industrial enterprises cannot suddenly collapse. The needs of a civilized and wealthy nation will continue to exist. In the opinion of the writer, there was never a more favorable outlook for animal husbandry on the farms of America than at the present time. Temporary low prices may, and undoubtedly will prevail, but skillfully conducted animal husbandry for a series of years is undoubtedly the most stable and economically sound system of farm management on the American farm at the present time.

THE DEVELOPMENT OF THE EXPORT TRADE IN PURE-BRED LIVE STOCK.

(By Geo. M. Rommel, Animal Husbandman, Bureau of Animal Industry.)

The exportation from the United States of meat-bearing animals and horses for city business, farm purposes, and pleasure has for many years been an important factor in our foreign trade. The accepted value of such animals in the world's markets, the rapid improvement of breeding animals in the United States, and the belief of many in the wisdom of providing an opening for the disposal of surplus American breeding stock has led to efforts on the part of individual breeders, breeders' associations and the Federal Government to study the possibilities of developing a trade in breeding stock with foreign lands. In the palmy days of the American Merino sheep, the demand from Australia and other countries was a very large factor in the trade, and even now, the purchaser of rams of the various Merino types must meet the competition of foreign buyers. Whether this trade can be built up again on a considerable scale and whether it can be developed for all classes of American live stock, is a question in which there is a growing interest.

At the present time, the export trade in breeding animals is very small. Just how many animals are sent abroad annually for breeding is not known, because customs officers are not required to report such export movements, and breeders' associations, almost without exception, do not keep such records. We can gain a fairly definite idea, however, from the figures for the exports of animals to countries in South America, Africa, Asia and Oceania, as it is known that with the possible exception of countries on the north of South America, exports of animals to these sections of the world for other purposes than breeding are insignificant. Considerable numbers of breeding animals go each year to Canada, Mexico, the Central American states, and Cuba, but very much larger numbers are sold to these countries for other purposes. The following table is, therefore, made up from the reports of trade and navigation of the Department of Commerce and Labor, showing for the ten fiscal years, from 1897 to 1906, the total exports of cattle, hogs, horses and sheep to the countries above mentioned. These figures show, approximately, our foreign trade in pure-bred live stock. A detailed table showing the exports to all countries for the period named appears at the close of this article.

EXPORTS OF PURE BRED CATTLE, HOGS, HORSES AND SHEEP FROM THE UNITED STATES TO SOUTH AMERICA, ASIA, OCEANIA AND AFRICA, YEARS ENDING JUNE 30, 1897-1906.

Year.	Cattle.		Hogs.		Horses.		Sheep.	
	No.	Value Dollars.	No.	Value Dollars.	No.	Value Dollars.	No.	Value Dollars.
1897	202	11,918	2,623	13,597	536	61,245	1,515	39,026
1898	324	10,182	3,660	19,701	488	58,210	1,751	39,799
1899	538	29,861	6,181	34,363	939	96,555	1,499	29,426
1900	86	5,405	2,739	18,652	13,300	1,281,694	1,208	20,703
1901	972	70,816	23	633	42,920	3,935,440	1,092	17,166
1902	926	39,873	33	885	60,562	6,147,955	1,115	26,311
1903	8,161	209,717	242	2,169	310	68,640	1,171	21,226
1904	5,572	193,646	40	1,334	126	29,132	992	30,743
1905	1,045	81,852	39	1,536	219	35,763	4,653	22,067
1906	1,862	153,849	81	3,555	66	40,360	760	18,402

*The exports of horses for the years 1900 to 1902, inclusive, were greatly enlarged on account of the purchases of the British Army for use in South Africa. Exports to British South Africa for these three years are given as follows:

Year.	No.	Value Dollars.
1900	8,199	797,372
1901	37,465	3,468,455
1902	60,469	6,106,810

Comparing the figures in the above table with those for all exports of animals, it is apparent that of the live animals sold abroad, the vast majority are destined for slaughter soon after landing or accompany emigrants. Nearly all European countries prohibit the importation of ruminant animals and hogs, except for immediate slaughter, and the only animals which go to those countries under other conditions are horses, and perhaps a few pets and poultry. Of the horses, nearly all are used for pleasure or business, and few for breeding; however, a sufficient number of American trotters have gone to Europe to give the breeed an excellent reputation. Of the large numbers of horses which go to British North America each year few are pedigreed stock to be used for breeding; most of them accompany American farmers who are emigrating to the Canadian Northwest.

The countries of the world, whose markets appear to offer the greatest opportunities for the development of an American export trade in breeding stock, are those of Europe, for trotting horses; Canada, for trotting and draft horses; Mexico, those of Central

America, the West Indies, and South America, for cattle, hogs, horses and sheep; China and Japan for horses, cattle and hogs; and South Africa and Australia, for sheep. From the standpoint of location, the parts of the world to which American breeders should logically look for the disposition of their surplus, are countries of the western hemisphere, south of the United States. In those countries there is a growing demand for improved blood, and stockmen are ready to spend money freely for animals of the right sort to improve their stock. In considering the subject we can afford to devote our time almost exclusively to conditions and possibilities as they obtain there.

OBSTACLES IN THE WAY OF FOREIGN TRADE—INADEQUATE MEANS OF COMMUNICATION.

The greatest drawback to the development of trade with countries south of us, especially those in South America, is the absence of good means of communication. There are few steamship lines running direct from New York or other ports of the United States to the great South American ports like Rio Janeiro and Buenos Ayres. One might almost say that there are no good ones. It is said that if a man wishes to get to either of those cities in the shortest possible time he can best go first to England by a fast Trans-Atlantic boat and trans-ship there to South America. Naturally the same is true of fast mail transportation. It is also said to be true that in Eastern South America banks sell exchange to the United States, not direct on New York, but via London. Therefore, if your South American buyer, when dealing with the United States, must have his animals shipped on slow boats, with inferior accommodations, and must pay for them by exchange on London, it is more than probable that he will discriminate against American animals as long as such conditions obtain. At best, crossing the Equator is a trying ordeal for live stock, and one which should be made as short as possible. Likewise, it is more convenient to buy exchange direct than in a roundabout way. Trade conditions are, therefore, decidedly against the American breeder.

This condition is one which has received a great deal of attention lately, as it is the principal drawback to United States trade of every kind with South American countries. Theoretically and sentimentally, the countries of South America should be our best customers; actually, they are not by any means. It is doubtful, however, whether our relations with those countries were ever so close as they are today, and it is quite likely that the near future will see an improvement in business relations with that part of the world. When fast steamer routes are opened, stockmen will have at their command more rapid and better means of shipment, and we may then see one very serious obstacle to this trade removed. With the increase of business of all kinds with South America, more convenient methods of exchanging money and credit will naturally follow.

DISEASE IN FOREIGN COUNTRIES.

The presence of disease in foreign countries is a second obstacle to the development of an export trade. Healthy, but non-immune American animals coming into contact with infected ones after landing are liable to sicken and die, and no matter what the cause, the American animal will get the reputation of being unable to stand the climate. This is particularly to be guarded against in the export of cattle to countries in which Texas fever exists. This disease is perhaps the one most to be feared by the exporter; but, fortunately, our knowledge of it is now such that it is possible so to handle shipments that the danger of loss is reduced to a minimum. No cattle should be shipped to the West Indies, Mexico, Central America, South America, Australia, Africa or other countries bordering on the tropics, except to those sections which are known to be free from Texas fever, without having been first rendered immune by some form of inoculation. The disease is also found in Southern France, Italy, Turkey, along the Danube river in Roumania, in Ireland, Finland, Southern Russia, China, and Japan.* Immunity may be brought about either by direct blood inoculation, or by inoculation of young animals by the infected cattle tick itself. For more complete safety, shipments from herds south of the Texas fever quarantine line would probably be most satisfactory.

It should also be borne in mind that many other diseases, even more dangerous than Texas fever, exist in some foreign countries, and losses are likely to follow American exportations. The prevalence of disease in these countries can readily be ascertained by the prospective American exporter by reference to the annual reports of the Bureau of Animal Industry. Where diseases, such as surra, are prevalent, no cattle should be sent, except with an understanding with the buyer that the cattle, although healthy when exported, are at the buyer's risk after landing. No horseman, for example, should be so foolish as to guarantee that his horses will live in South Africa—a country where diseases peculiar to the horse race are especially common and virulent. The ability of animals to "stand the climate" is more frequently a matter of resistance to diseases, and we should not expose our stock to fatal contagion at the risk of ruining what may be a very profitable export trade.

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*Bulletin No. 78, Bureau of Animal Industry.

FRAUDS IN PEDIGREES.

Complaints have not seldom reached the Bureau of Animal Industry that some unscrupulous speculators has foisted inferior animals on foreign buyers, especially in Mexico. It is stated that grade dairy cattle have been taken to that country and sold as pure-bred, registry certificates being furnished which were manufactured and printed by the dealer, who was not in any way connected with a reputable pedigree record association certified by the Secretary of Agriculture. This can be easily remedied by prohibiting the export of animals for breeding purposes, unless they are accompanied with certificates of the secretary of an association which has the certification of the Secretary of Agriculture, and these certificates in turn certified as genuine by an official of the United States Government, preferably the Secretary of Agriculture. Foreign buyers would soon learn that a certificate to be genuine should bear the stamp of approval of the Agricultural Department, and that the purchase of an animal not accompanied by such a certificate would be at the buyer's risk. A departure of this kind would not be without precedent. All animals shipped abroad are already first subject to a sanitary inspection, and all meat and meat products exported are first thoroughly inspected, the certificate of the Secretary of Agriculture that the animals or animal products are healthy and wholesome for human food accompanying the shipment. If the Secretary of Agriculture is empowered to certify to the health and wholesomeness of such exports, it would not be a radical departure at all to empower him to certify to the pure breeding of animals sent abroad for breeding purposes.

HOW THE EXPORT TRADE MAY BE BUILT UP—THE IMPORTANCE OF ADVERTISING.

Granted that the preliminaries to a thriving export trade are provided—good steamship lines, good exchange, and the like—it then remains to show the foreign buyer what we have from the standpoint of individuality, to prove to his own satisfaction the worth of American breeding stock. To this end, a thorough campaign of education and exploitation is necessary. Through American consuls, literature can be distributed, setting forth the merits of our animals. By advertising and by correspondence, using foreign newspapers as freely as possible, the same end can be accomplished. One attempt should not be regarded as sufficient, but breeders should hammer away at the same point until an opening is effected. It might pay breeders' associations to club together, as it were, and employ a good wide-awake man as a commercial agent to be stationed, say at Rio Janeiro or Buenos Ayres, to solicit trade, handle importations, manage sales, and attend to the thousand and one details which would come up in connection with such a position. On account of his familiarity with local conditions, such a man could be of the greatest assistance to the American exporter, and could save him many a troublesome experience. By pooling expenses, the burden of his support would be only nominal to any one association entering into the arrangement. One of the strongest features of this plan of selling would be its semi-official character. Working under the auspices of reputable breeders' associations certified by the United States Secretary of Agriculture, selling animals, whose pedigrees were also certified by the Secretary of Agriculture, the American seller could give his customers every assurance that they would get value received and honest dealing.

Experimental shipments of first-class animals, such as have already been made by several Americans, are of the greatest value in showing stockmen in other countries what kind of live stock the United States produces. Sent to a foreign country under competent care, and landed in good condition, they will be almost certain to create a good impression and stimulate trade.

A further means of education can be obtained by an effort to bring the representatives of foreign countries in the United States into touch with our live stock interests. Once or twice this has been tried, with rather indifferent success. If we could get foreign diplomats and consuls to attend our great live stock shows occasionally, so that they could see for themselves we could more easily build up a foreign trade. Governments send their representatives abroad, not alone on matters of statesmanship, but on business affairs as well. Doubtless many a clever American invention has found a ready sale abroad, for the reason that a representative of a foreign government in the United States saw it in successful operation, and interested his countrymen in it. The same could be done in the case of American breeding stock. The tremendous energy and remarkable progressiveness of the Japanese in this respect are cases in point, and what may be expected from such a source by the American stock breeder is indicated by the rather large purchases of horses and dairy cattle made by Japan during recent years. That country is also awakening to the profit of the dairy industry, and when once started, her demand for dairy breeding stock is more likely to seek its supply in the United States than elsewhere. Still another fact which illustrates this point is that the attendance of young men from Mexico and South America at our agricultural colleges, especially those institutions which pay a large amount of attention to animal husbandry, is stimulating in their home countries a demand for pure-bred live stock, which will certainly enlarge the market at the command of the American breeder.

I have alluded to the apparent difficulty of getting foreign representatives to attend our stock shows, and this leads me to suggest that the same end might be accomplished if the Government itself maintained a breeding farm, where representative animals of the leading breeds could be kept. Such a farm, properly equipped, suitably maintained, and located near Washington, would be one of the points of interest of the National Capital. Foreigners stationed at Washington could see, at a minimum of time and trouble, what the United States can produce in live stock, and by prohibiting the sale for export of animals from this farm, the Government could safeguard and encourage the interests of American breeders. It would not be official representatives alone whose interest could be excited by such a farm, but visitors who come to the United States on their own business or pleasure, would, if interested in live stock, be very sure to make such an establishment one of their points to visit. When we think that nearly all visitors to the United States from abroad visit Washington, the advertising possibilities of a national breeding farm can be appreciated.

THE IMPORTANCE OF AMERICAN TYPES AND BLOOD LINES.

A suggestion of the highest importance was recently made, that our breeders cannot hope to develop an export trade of any magnitude until they advertise their animals as American, and the stockman who made this suggestion pointed out that until we are able honestly to claim for our own American-bred animals, that because they are American-bred they are better than animals bred in other countries, we cannot expect the foreign breeder to adopt such a view. So long as we advertise our Shorthorns as Scotch, and claim that for this reason they are the best we can produce, the Shorthorn breeder in Argentina will go to Scotland for his bulls. So long as our Percheron breeders believe that the best they can use on their mares are imported stallions, the South American horseman will go to France for Percheron stallions. The standing of the American Trotter the American Saddle Horse, the American Merino Sheep, the American hog, and the American hen, has been made permanent in the world's opinion, because these breeds have stood on their own merits without fear or favor and without requiring an imported prop for support. It is highly gratifying that several of our breeds of cattle have been so much improved since they were first imported, that they are now actually more efficient and profitable under American conditions than the same breeds in the countries of origin, and it is rare that the American breeder of such cattle finds an importation to his advantage. If these cattle are better adapted for the production of meat, milk, and butter in America than their foreign relatives, does it not hold true that they would be better for the same purpose in Argentina, Brazil, Uruguay, or other cattle breeding countries? If this is true, why should it be difficult to prove the fact to the satisfaction of Argentine, Brazilian, Uruguayan, or other foreign breeders?

THE VALUE OF AN EXPORT TRADE DURING PERIODS OF LOW PRICES.

Lastly, the possibility of a foreign trade in breeding animals stands in direct ratio to the production of a surplus in the United States. Given a surplus, the trade will seek an outlet, either by way of the market, the abattoir, or by export for breeding purposes. It would be unfortunate, indeed, if a fall in prices for breeding animals would force the sale of our pure-bred cattle, sheep, and hogs for slaughter, or of our pure-bred horses for use on city streets. It is, therefore, timely that breeders' associations are interesting themselves in the development of the foreign trade. If a time of diminished values is now really upon us, the opening of a trade with other lands will save breeders from the disastrous sacrifices to which they were forced from 1893 to 1897.

EXPORTS OF CATTLE FROM THE UNITED STATES BY COUNTRIES—YEARS ENDING JUNE 30, 1897-1901.

Countries.	1897		1898		1899		1900		1901	
	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars
Europe—										
Belgium	1,086	99,100	......	......	......	......	......	......	230	23,000
Denmark	......	......	......	......	......	......	......	......	......	......
Germany	633	55,525	......	......	......	......	500	50,000	46	3,220
Netherlands	1,929	178,500	......	......	......	......	......	......	345	31,050
United Kingdom	378,459	35,374,322	378,956	35,431,464	308,126	28,213,572	302,195	27,935,747	376,380	35,311,949
North America—										
Bermuda	1,638	110,154	1,657	124,694	1,617	130,375	1,669	128,830	1,575	114,959
British Honduras	122	3,612	42	2,018	7	135	......	......	159	7,169
Canada	6,812	459,036	15,804	1,068,139	3,709	221,037	5,233	306,645	13,333	605,907
Newfoundland and Labrador	......	......	1	100	......	......	......	......	......	......
Central American States—										
Costa Rica	4	590	27	3,280	12	1,330	14	1,200	......	......
Guatemala	232	10,661	22	1,070	14	420	......	......	3	425
Honduras	20	300	......	......	24	1,325	......	......	16	500
Nicaragua	11	848	......	......	2	275	......	......	6	520
Salvador	8	550	7	690	......	......	1	50	......	......
Mexico	690	29,186	1,953	78,400	2,301	98,920	3,761	152,131	2,608	126,628
West Indies—British	206	14,404	270	21,899	244	16,994	177	12,355	141	9,317
Cuba	95	5,265	40,186	1,085,299	72,890	1,802,149	83,649	2,042,710	63,392	1,261,027
Danish	......	......	1	40	......	......	......	......	......	......
French	20	1,800	......	......	......	......	......	......	12	500
Hayti	23	1,680	5	225	6	440	1	80	......	......
South America—										
Argentina	1	500	3	1,200	10	3,025	......	......	......	......
Brazil	......	......	8	700	......	......	7	490	948	68,511
Chile	4	440	......	......	......	......	......	......	......	......
Colombia	......	......	267	4,880	209	1,896	......	......	6	310
Ecuador	......	......	......	......	2	175	......	......	......	......
Guiana—Dutch	......	......	......	......	......	......	......	......	1	80
Venezuela	39	2,194	7	682	2	97	1	150	6	705

Asia—										
Chinese Empire	9	1,150	.....	.....	1	125	.....	.....	.....	.....
Hongkong	43	2,150	1	100	6	300	.....	.....	.....	.....
Japan	5	220	13	610	26	3,000	1	50	6	300
Oceania—										
British Australasia	.....	.....	1	100	.....	.....	.....	.....	2	500
Hawaii	100	4,914	24	1,910	208	9,870	75	4,215	.....	.....
Africa—										
British—South	1	350	.....	.....	74	11,373	2	500	3	410
Totals	392,190	36,357,451	439,255	37,827,500	389,490	30,516,853	397,286	30,635,153	459,218	37,566,980

EXPORTS OF CATTLE FROM THE UNITED STATES BY COUNTRIES, YEARS ENDING JUNE 30, 1902-1906.

Countries.	1902		1903		1904		1905		1906	
	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars
Europe—										
Belgium	826	82,600	1,824	186,303	18,350	1,768,860	7,301	703,681	9,516	918,620
Denmark	......	......	......	......	......	......	......	......	332	29,980
Spain	......	......	50	2,250	......	......	......	......	......	......
United Kingdom	284,999	27,114,151	277,226	26,597,390	387,467	36,110,806	391,715	36,722,387	405,277	37,729,300
North America—										
Bermuda	2,239	174,659	1,735	124,048	1,683	118,217	1,841	129,874	1,503	109,889
British Honduras	52	1,454	13	547	2	65	2	46	5	151
Canada	18,780	719,761	35,583	1,231,714	38,080	1,492,248	21,056	435,212	15,633	453,350
Newfoundland and Labrador	17	1,100	......	......	......	......	......	......	......	......
Central American States—										
Costa Rica	15	1,980	26	2,420	3	300	17	780	25	1,500
Guatemala	......	......	......	......	3	104	16	850	32	2,815
Honduras	......	......	2	130	......	......	19	908	3	232
Nicaragua	12	980	1	50	10	830	11	990	8	401
Panama	......	......	......	......	33	1,105	114	4,396	33	1,880
Salvador	7	600	......	......	2	150	3	495	5	750
Mexico	4,728	225,138	4,908	237,008	6,218	341,473	7,947	392,115	18,641	666,962
West Indies—British	1,331	62,844	1,060	53,889	853	43,178	1,186	58,208	572	29,205
Cuba	78,023	1,441,840	70,812	1,168,382	134,781	2,166,485	135,421	2,062,483	130,639	1,977,088
Danish	120	3,400	136	5,460	90	3,200	14	280	87	2,800
Dutch	......	......	61	2,806	2	75	3	54	1	63
French	804	31,562	575	26,452	245	15,189	24	1,140	......	......
Hayti	3	180	4	320	......	......	......	......	......	......
Santo Domingo	2	90	1	50	15	360	71	2,297	65	2,335
South America—										
Argentina	......	......	2	2,080	3	1,400	......	......	30	13,600
Brazil	170	13,600	341	26,300	328	26,330	890	71,668	1,359	104,890
Chile	1	175	......	......	......	......	......	......	......	......
Colombia	19	1,175	6	310	......	......	......	......	......	......
Ecuador	......	......	3	400	......	......	......	......	......	......

Guiana—British	....	....	....	....	....	....	....	....	1	200
Dutch	4	170	....	....	8	483	....	....	....	....
French	....	....	751	42,148	172	7,530	....	....	....	....
Peru	1	100	2	200	7	610	....	....	....	....
Venezuela	8	440	4	236	20	1,292	75	3,664	24	1,367
Asia—										
Chinese Empire	....	....	....	....	5	700	14	1,885	48	8,156
Hongkong	35	1,760	12	600	3	200	....	....	15	1,500
Japan	4	225	....	....	25	1,100	22	3,310	78	5,961
Russia—Asiatic	....	....	....	....	....	....	....	....	162	6,575
Oceania—										
British Australasia	....	....	11	1,800	4	600	....	....	9	1,000
Philippine Islands	....	....	....	....	14	1,650	3	725	....	....
Africa—										
British—South	684	22,228	7,029	135,643	4,983	151,751	41	600	136	10,600
Totals	392,884	29,902,212	402,178	29,848,936	593,409	42,256,291	567,806	40,598,048	584,239	42,081,170

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*Reports of Commerce and Navigation, U. S. Department of Commerce and Labor.

EXPORTS OF HOGS FROM THE UNITED STATES BY COUNTRIES—YEARS ENDING JUNE 30, 1897-1906.

Countries.	1897		1898		1899		1900		1901	
	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars
Europe—										
Austria-Hungary	9	245								
France					98	1,960				
Italy							10	85		
Portugal	2	40					2	35		
Russia—European					12	300				
United Kingdom	66	539	1,030	7,987	20	125	2	20		
North America—										
Bermuda	12	100	8	83	26	270	2	204	61	916
British Honduras					10	52			5	25
Canada	3,768	17,883	4,039	24,940	1,363	6,847	977	7,022	1,427	12,886
Central American States—										
Costa Rica	74	208			2	8	2	15	25	300
Guatemala	23	160	2	36	6	18	2	25	8	60
Honduras	5	83	105	1,680					2	40
Nicaragua									4	40
Salvador			15	100						
Mexico	22,164	263,083	4,097	44,487	7,390	87,642	4,777	69,106	2,904	32,709
West Indies—British			9	177	9	130	1	26	4	80
Cuba			1,426	11,109	17,908	95,446	42,644	299,623	17,851	190,748
Danish									2	8
Dutch					2	10				
French			13	75						
Hayti	2	12			4	70			2	20
Santo Domingo	3	48	7	112						
South America—										
Argentina			4	100						
Brazil			2	32	24	1,000			2	40
Colombia	4	40	3	40	8	137	3	25	10	135
Ecuador					2	60				
Guiana—British	4	70							1	30
French					6	30				
Peru									1	50

Venezuela			15	316	2	26				
Asia—Japan							35	150		
Oceania—										
British Australasia			4	100					4	200
German Oceania									2	50
Hawaii	2,615	13,487	3,632	19,113	6,139	33,110	2,699	18,427		
Africa—										
British—South							2	50	3	128
Totals	28,751	295,998	14,411	110,487	33,031	227,241	51,180	394,813	22,318	238,465

EXPORTS OF HOGS FROM THE UNITED STATES BY COUNTRIES—YEARS ENDING JUNE 30, 1902-1906.

Countries.	1902		1903		1904		1905		1906	
	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars
Europe—										
Azores and Maderia Islands	....	....	6	82	....	....	....	....	2	32
Belgium	....	....	....	....	1,450	11,600	....	....	....	....
Portugal	....	....	6	34	2	32	....	....	....	....
Russia—European	6	50	....	....	....	....	....	....	....	....
United Kingdom	....	....	....	....	....	....	350	3,306	692	6,920
North America—										
Bermuda	117	1,634	166	4,181	155	1,660	127	1,235	....	....
British Honduras	....	....	....	....	2	16	1	20	1	20
Canada	2,352	17,535	1,318	11,608	1,971	14,953	32,906	300,712	39,997	406,054
Central American States—										
Costa Rica	20	110	13	103	4	29	....	....	11	79
Guatemala	4	32	....	....	6	82	1	10	9	81
Honduras	....	....	4	24	2	14	1	15	4	30
Nicaragua	....	....	28	138	6	125	6	21	17	430
Panama	....	....	....	....	10	150	3	105	4	10
Salvador	....	....	....	....	2	60	....	....	....	....
Mexico	2,002	25,939	1,191	11,470	1,201	10,679	6,478	76,720	12,960	167,386
West Indies—British	6	104	2	54	3	30	....	....	22	282
Cuba	3,826	42,023	851	11,013	1,482	12,891	4,572	32,845	5,358	45,953
Danish	....	....	4	47	....	....	....	....	....	....
French	....	....	....	....	....	....	....	....	1	10
Hayti	2	18	....	....	2	12	7	112	5	62
Santo Domingo	....	....	....	....	7	113	5	55	6	94
South America—										
Argentina	7	275	....	....	5	400	5	275	55	2,750
Bolivia	10	160	....	....	....	....	....	....	....	....
Brazil	8	150	4	150	6	101	2	35	17	647
Chile	5	100	8	135	....	....	....	....	....	....
Colombia	....	....	3	51	9	182	7	51	....	....
Guiana—British	....	....	2	30	....	....	1	35	....	....
Venezuela	3	200	....	....	13	251	11	116	3	48
Asia—Japan—	....	....	....	....	....	....	11	1,000	3	45

Oceania—										
British Australasia	....	....	....	....	3	300	....	....	....	....
All other British Oceania	....	....	....	....	....	....	2	24	....	....
Philippine Islands	....	....	....	....	4	100	....	....	....	....
Africa—										
British—South	....	....	225	1,803	....	....	....	....	3	65
Totals	8,368	88,330	4,031	40,923	6,345	53,780	44,496	416,692	59,170	630,998

*Reports of Commerce and Navigation, U. S. Department of Commerce and Labor.

EXPORTS OF HORSES FROM THE UNITED STATES BY COUNTRIES—YEARS ENDING JUNE 30, 1897-1906.*

Countries.	1897		1898		1899		1900		1901	
	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars
Europe—										
Azores and Maderia Islands							2	250	2	400
Belgium	4,213	465,365	7,356	746,025	4,735	476,600	3,481	357,909	918	91,900
France	23	8,500	72	9,000	2	480	12	19,050	1	75
Germany	4,897	822,250	7,913	1,161,750	6,166	921,595	3,647	544,055	869	141,460
Gibraltar	4	1,200					3	2,200		
Italy	1	800	203	23,145	89	12,000				
Norway and Sweden					28	2,800				
United Kingdom	19,350	2,579,736	22,129	3,072,498	20,929	3,024,952	30,232	4,205,376	22,698	3,481,467
North America—										
Bermuda	49	5,960	49	8,798	50	6,395	75	9,255	62	5,375
British Honduras	125	6,080	11	350	13	863			11	3,050
Canada	3,902	478,574	9,413	874,374	10,088	667,165	8,828	856,981	9,303	863,031
Newfoundland and Labrador			2	300			2	225	2	600
Central American States—										
Costa Rica	8	1,732	34	3,400	3	650	1	250	34	7,150
Guatemala	278	26,585	42	3,850	1	30	36	3,600	18	3,625
Honduras	59	2,100	147	5,195	72	4,015	1	50	2	350
Nicaragua	13	1,275			10	670	1	50		
Salvador	3	400							5	800
Mexico	1,884	88,978	1,297	77,090	1,138	81,849	1,663	120,904	739	65,628
Miguelon, Lingley, etc	1	125								
West Indies—British	241	21,928	350	40,072	222	25,063	125	12,900	199	26,290
Cuba	3,889	194,180	1,580	83,310	1,244	115,235	3,247	189,757	4,436	240,894
Danish			3	550						
Dutch			2	286			1	130		
French	13	2,415	32	3,401	37	4,005	38	4,845	28	5,470
Hayti	13	2,745	13	2,075	4	615	2	260	1	240
Porto Rica	19	4,590	7	915	1	1,500	25	2,875		
Santo Domingo	11	2,502	7	1,975	7	1,305			2	600
South America—										
Argentina			1	700						
Brazil							4	1,000	1	200

Chile					2	200				
Colombia	2	120	7	1,050			4	530	3	800
Guiana—British	131	1,425	5	750	12	1,200	8	700	3	525
French					6	720				
Venezuela	37	10,110	8	3,200	13	2,439			18	4,300
Asia—										
Chinese Empire							1	75	2,317	192,050
East Indies—British Straits Setl., other British			3	300						
Hongkong			2	500	2	1,000				
Japan	9	1,160			1	225			1,535	153,950
Oceania—										
British Australasia	2	1,000			1	500	6	4,300		
French Oceania			4	490						
Guam							4	350		
Hawaii	354	37,030	341	33,635	775	73,591	706	74,922		
Philippine Islands							2,347	211,550	1,578	115,160
Africa—										
British—South	1	400	117	17,585	127	16,680	8,199	797,372	37,465	3,468,455
Portuguese—Africa							2,021	190,895		
Totals	39,532	4,769,265	51,150	6,176,569	45,778	5,444,342	64,722	7,612,616	82,250	8,873,845

*Reports of Commerce and Navigation, U. S. Department of Commerce and Labor.

EXPORTS OF HORSES FROM THE UNITED STATES BY COUNTRIES—YEARS ENDING JUNE 30, 1902-1906.

Countries.	1902		1903		1904		1905		1906	
	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars
Europe—										
Azores and Maderia Islands	2	1,100								
Belgium	441	50,620	88	15,132	110	15,860	96	19,800	77	12,750
Denmark									1	250
France							5	1,800	142	10,775
Germany	122	23,300	147	17,925	197	29,153	129	35,300	102	18,113
Gibraltar					1	200				
Italy					4	750				
Norway and Sweden			1	50						
Russia—European			14	1,400					2	3,000
United Kingdom	10,015	1,593,340	3,755	688,940	2,325	412,760	1,635	505,365	916	261,675
North America—										
Bermuda	47	8,465	62	9,000	83	13,468	46	9,442	20	3,525
British Honduras			1	125	3	410			4	400
Canada	23,182	1,807,998	24,965	2,121,864	24,672	2,098,685	18,444	1,877,018	31,916	3,435,504
Newfoundland and Labrador	1	300			14	1,300	29	2,750	3	285
Central American States—										
Costa Rica			2	40			11	2,991	101	10,094
Guatemala	57	5,967			8	1,300	9	1,150	26	4,025
Honduras	1	135			7	1,240			12	1,075
Nicaragua	4	2,995					2	1,000		
Panama					1	74	9	1,350	10	1,525
Salvador	2	500	1	175	1	100	1	225		
Mexico	3,763	154,697	1,316	92,249	2,262	164,363	2,151	239,078	2,588	299,821
West Indies—British	152	26,003	179	26,204	163	28,280	186	38,355	59	11,035
Cuba	4,537	215,816	3,117	105,469	11,945	380,272	11,718	396,780	4,002	248,154
Danish					12	1,458	34	1,335	8	240
Dutch	2	169	1	27			38	1,685		
French	50	3,579	29	1,924	43	7,570	7	1,260	1	100
Hayti	1	200	5	2,150	5	1,120			2	500
Santo Domingo	79	4,907	14	845	19	1,605	53	2,812	29	2,775
South America—										
Argentina									4	2,000

Brazil	1	100	3	600	2	350	....	....	....	....
Colombia	20	2,000	25	1,675	11	850	....	....	....	....
Guiana—British	9	2,585	....	....	19	2,847	8	1,333	4	950
Dutch	....	....	....	....	1	140	3	595	....	....
French	1	200	....	....	6	240	....	....	....	....
Peru	....	....	....	....	2	950	....	....	4	1,500
Uruguay	....	....	1	250	....	....	....	....	....	....
Venezuela	25	6,610	....	....	5	2,025	10	3,325	2	525
Asia—										
Chinese Empire	7	400	2	200	....	....	....	....	1	400
East Indies—British Straits Setl., other British	....	....	3	650	....	....	....	....	....	....
Japan	21	16,550	40	16,350	31	5,775	32	8,170	42	32,600
Russia—Asiatic	2	300	2	400	....	....	6	1,500	....	....
Oceania—										
British Australasia	6	12,000	4	4,700	17	6,900	11	7,800	4	1,750
All other British Oceania	....	....	....	....	....	....	....	....	2	135
French Oceania	1	400	....	....	4	675	6	450	1	150
Philippine Islands	....	....	....	....	....	....	....	....	2	350
Africa—										
British—South	60,469	6,106,810	180	38,815	28	8,380	143	12,590	....	....
Turkish—Egypt	....	....	50	5,000	....	....	....	....	....	....
Totals	103,020	10,048,046	34,007	3,152,159	42,001	3,189,100	34,822	3,175,259	40,087	4,365,981

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*Reports of Commerce and Navigation, U. S. Department of Commerce and Labor.

EXPORTS OF SHEEP FROM THE UNITED STATES BY COUNTRIES—YEARS ENDING JUNE, 1897-1901.

Countries.	1897		1898		1899		1900		1901	
	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars
Europe—										
Belgium	3,751	34,406	....	....	....	....	....	....	440	4,120
Germany	....	....	1	50	....	....	....	....	....	....
United Kingdom	180,304	1,316,104	142,178	1,016,895	98,080	702,347	73,126	560,166	219,426	1,655,949
North America—										
Bermuda	2,187	14,763	2,130	16,897	1,883	14,864	2,248	20,800	2,570	16,075
British Honduras	19	72	2	5	25	85	....	....	60	255
Canada	48,437	90,353	48,325	108,446	34,782	75,323	43,535	98,403	69,669	216,680
Central American States—										
Costa Rica	....	....	18	72	3	15	13	54	2	12
Guatemala	....	....	....	....	8	40	....	....	....	....
Honduras	....	....	....	....	....	....	....	....	8	18
Mexico	4,628	11,877	2,359	9,748	3,235	11,525	3,011	16,931	2,713	7,286
West Indies—British	3,277	25,007	2,853	21,267	1,762	14,277	1,375	11,184	1,478	11,552
Cuba	....	....	57	537	2,009	5,653	1,236	5,115	467	3,887
Danish	....	....	....	....	....	....	15	86	....	....
French	1	25	13	80	....	....	5	35	....	....
Hayti	1	12	3	90	....	....	....	....	....	....
South America—										
Argentina	4	300	51	1,320	4	400	25	2,500	....	....
Brazil	....	....	....	....	....	....	5	206	2	85
Colombia	....	....	13	75	....	....	....	....	3	125
Guiana—British	1,211	8,485	1,411	11,014	1,176	8,220	1,080	7,997	949	7,165
French	10	51	....	....	....	....	....	....	3	21
Uruguay	51	5,100	....	....	....	....	....	....	....	....
Venezuela	4	140	....	....	....	....	....	....	....	....
Oceania—										
British Australasia	98	13,720	183	18,300	55	8,100	98	10,000	82	6,690
French Oceania	....	....	....	....	....	....	....	....	2	14
Hawaii	29	430	....	....	149	1,466	....	....	....	....

Africa—										
British—South	108	10,800	93	9,090	56	5,340	....	....	51	3,066
All other Africa	....	....	....	....	59	5,900	....	....	....	....
Totals	244,120	1,531,645	199,690	1,213,886	143,286	853,555	125,772	733,477	297,925	1,933,000

*Reports of Commerce and Navigation, U. S. Department of Commerce and Labor.

EXPORTS OF SHEEP FROM THE UNITED STATES BY COUNTRIES—YEARS ENDING JUNE, 1902-1906.

Countries.	1902		1903		1904		1905		1906	
	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars
Europe—										
Belgium	200	1,000	298	2,394	9,809	77,662	2,074	17,156		
France	198	1,980								
Gibraltar					2	25				
United Kingdom	203,880	1,476,577	111,688	809,782	223,057	1,598,863	185,105	1,373,683	65,318	486,252
North America—										
Bermuda	2,587	16,351	4,072	24,479	3,203	20,852	2,846	19,605	2,268	18,249
British Honduras							7	15		
Canada	146,503	383,225	54,371	174,437	60,218	187,742	68,611	202,332	68,951	212,450
Central American States—										
Costa Rica	15	90	7	25			6	30		
Guatemala							10	100		
Nicaragua			12	40	23	115			4	56
Panama							10	70	2	22
Salvador							1	150		
Mexico	2,116	16,765	3,776	22,442	2,183	25,218	3,621	41,914	4,436	62,599
West Indies—British	1,791	14,382	1,184	9,856	1,649	12,530	1,165	8,821	665	5,018
Cuba	291	3,223	258	2,268	141	648	128	938	168	835
Danish			124	911	36	206	116	326	118	207
Dutch	24	156								
French							12	114		
South America—										
Bolivia	24	980								
Brazil					1	8				
Chile			100	1,920			7	200		
Guiana—British	941	7,074	852	6,468	691	5,063	461	3,620	503	4,240
Dutch					92	752				
French	3	32	10	95						
Peru	2	50	14	122	2	70				
Uruguay							2	400	12	1,100
Venezuela	3	75							5	235

Oceania—										
British Australasia	58	6,100			61	10,000				
French Oceania									3	27
Africa—										
British—South	84	12,000	195	12,621	145	14,850	4,183	17,847	237	12,800
Totals	358,720	1,940,060	176,961	1,067,860	301,313	1,954,604	268,365	1,687,321	142,690	804,090

*Reports of Commerce and Navigation, U. S. Department of Commerce and Labor.

FARM MANAGEMENT.

(Professor J. W. Sanborn, Gilmanton, N. H.)

(Professor Sanborn was for several years Dean of Missouri Agricultural College and Secretary State Board of Agriculture, and during that time inaugurated some of the most important lines of investigations that have been carried out in Missouri.)

I left my home in the hills of New Hampshire to make a round trip of about 3,000 miles for the purpose of renewing old acquaintances, and for one brief hour as the guest of the Board of Agriculture, to renew, in a measure, semi-official relations with the farmers of Missouri. It is a great pleasure to me, not only to visit these scenes of past labor, and to meet with old friends, but it is also a pleasure to me to listen to the able speakers who have come here to discuss the larger issues of the hour. I am very much obliged to your Secretary for his kind invitation to come here, for the kind words of introduction he gave me, and for your kind reception. I should not be true to my feelings and, it seems to me to my obligations as a former secretary of this Board and Dean of your College of Agriculture, did I not express my gratification at the great expansion of the field of usefulness occupied by the Board of Agriculture through the industry and organizing capacity of its Secretary and the broad policy of the legislators. A record has been made creditable to him and to the State. I should not do justice to myself and to the occasion did I not express my great pleasure in the work being done by Dean Waters, in whom I take some pride as a former student in my classes. I have been with him over much of the work he is doing, and the work he proposes to do. Dean Waters is looking underneath the surface of things. He is doing some deep thinking, which bye and bye will have concrete expression and add to the future welfare of the agriculture of Missouri and of the nation, and his work as an organizer and investigator will have a marked influence in the development of this Agricultural College and the art of agriculture. All great people rest upon intellectual development, and the efforts of your Dean and your Secretary and other public-spirited men to expand your agricultural educational interests beginning with the primary schools, passing to the secondary schools, and then to the Agricultural Department of the State University, can not be too highly commended as the cornerstone of a co-ordinated system of agricultural education. I note that you have the work of primary and secondary agricultural education, not only in contemplation, but already in motion.

While you know Missouri as a great agricultural State, yet under the power of the intellectual development that a completed rural educational system will give, an agricultural Missouri undreamed of will evolve. On this fabric a mighty State will rise. Emerson said, "In the order of events intellect is primary and nature secondary." Intellect is the sovereign force of the universe, its creator and controller. Whether we are a spark of the divine intelligence or a separate creation, we, too, are masters, not only of the matter of our globe, but of the natural forces that are associated with it. Just in ratio, as we acquaint ourselves with and master those forces do we increase our productive powers. Somebody has said: "The course of nature is the art of God;" in other words, nature is endowed with laws. As farming, as no other industry, has to do with the laws of nature, so the farmer, of all men, should be most familiar with these laws. This means that he should master the natural and applied sciences as no other industrialist must. As the farmer is an executive in the handling of labor, of mercantile experience as a buyer and seller, a man of fine physical development from an out-of-door life occupied, as he is in varied work that applies all the muscles of the body; dealing with both art and with subtle, inter-related laws, he becomes a keen observer, and is a home owner and natural friend of stable society, a moral man and the balance wheel of the State. So it follows that the farmer to be is the man described by McCaulay as "the man of parts," and the measure of the world's progress as never before.

The farmers of Missouri must stand for a complete agricultural educational system, if they would stand for their highest good and for the highest good of the State. The progress of agriculture has been the measure of the progress of the State in its arts, literature, culture and wealth. Mind is the measure of the output of land as it is of the arts; hence the State is pre-eminently interested in the intellectual development of its agriculturists. Are these mere pleasing, self-complaisant sentiments, or are corroborating facts to be found?

While teaching agriculture over there in a little building, now in the midst of a sea of fine, large buildings, I hunted out the statistical crop returns of every state in the Union and of the nations of Europe, and found that the per cent. of literary of a people was the measure of the productiveness of the soil. Missouri, as I recall, had at that time about 87 per cent. of her people able to read and write to about 94 to 93 per cent. in Illinois and Kansas. The crops stood in this ratio. So it was between other states and sections of the nation. The same truth followed between the nations of Europe. Portugal stood at the bottom of the list in literary and in crops. The untutored Russian peasant on the far-famed black soils of his country, stood about next, while at the top was the canny Scotchman living on about the hardest soil of them all.

I am making the point that the measure of the production of an agricultural people is never the fertility of the soil, but the fertility of the intellect of those who till that soil. We should not live as guests of nature. Nature never meant that man should lean on her, and repels it by dwarfing him as an intellectual force and in the measure of his living. I have yet to learn of a people living on a very fertile soil who have not in the end suffered by that very fertility. This was one of the reasons, my friends, which encouraged me once again to take up life on the rugged hills and reluctant soils of New Hampshire against the protests of my friends. I make intelligence, then, as of primary importance in "The Management of a Farm."

The second element of importance in the management of a farm to which I invite attention is the permanency of the family on the farm. No agriculture will be at its best, and no state at its greatest whose farm families do not root back for a generation or generations, in the soil held, that does not bud in present occupancy and in expectation to flower in generations to come. Something of the life of the fathers is in the homes and improvements of the farm, and the spirit of their encouragement is at the home portals and hovers around the family fireside. No other occupation gives any security for family permanency and the certainty of social equality, of physical, moral, and intellectual vigor and of material independence. Anchor the family to the soil, and in this immortality in the family line find the encouragement for permanent improvements. Every drain, all increment of fertility and of crop yields, better buildings, landscape improvements bordering around them, the creation of a home of refinement, are but the best forms of heritage. Such a farm still compels action, while inherited money is an opiate to the energies.

The camp or tent farmer, who values the farm for only what he can extort for use in the pleasure of a retired life in town is not a constructive but a destructive farmer, a despoiler of land and buildings. He is an enemy to the higher interests of society and of his family. The tenant system now coming into vogue is the menace of western agriculture. The tenant is not the stuff out of which evolves a great agriculture, and a great state as incentive is wanting. In my own farm has been absorbed much of the lives of my ancestors back to the woods from which one of them wrung it. It is to memory dear. Sentiment holds me to it, and out of it I am determined to evolve a farm in scope and character adequate to maintain a sturdy and cultivated race of men and women. I know of no way to serve the family and the state better.

Thirdly. Our farm management should align itself up to the very hair with all those modern forces and their results that characterize the twentieth century.

What especially marks the industrial life of this century? Two things—its depth and breadth. Science and art in other industries exhaust themselves in the effort to secure all the possibilities that lie in each unit handled, and to handle all the units possible. Witness the great economies introduced into the manufacturing enterprises, and the saving of that which but yesterday was waste. The profit per unit turned out is today less than ever before in history, yet great profits and a high or costly plane of living is secured through the vast volume of units turned out. Scanning the decades, we find that the arts resting on the free use of mechanism are selling their products at constantly decreasing costs, amounting, in many cases, to but a mere fraction of old-time hand craft rates. On our part as farmers, in an age of great captains of industry, we follow the bugle notes of small farming, and are ever selling crops at advancing rates. We buy for less, sell at higher rates, and complain that farming does not pay. Our boys seek the town, both in the east and the west, for broader opportunities. These boys will not and should not remain on the farm until it can be made to yield the cultivated living secured by the better class of industrialists of our day, and find in the farm opportunities for mental activity and recognition common to those industries requiring intelligence and capital.

When thirteen, nearly fourteen, years ago, my father's hands began to drop by his side, I had to decide whether I should still be led by the boy's dream and take up the thread of life again on a granite hill farm of a back railroadless town, 4½ miles from a railroad and fifteen miles from any market. In eighteen years of absence the farm had gone badly to bushes and woods, and its buildings to decay. No field would cut a ton of hay, many would not cut more than one-fourth to one-tenth ton to the acre. None of the land was under the plow. Farms around it were selling at $10.00 per acre, a mere fraction of the cost of improvements on them. A meager living for hard work was had out of them. The average farm was not giving over from $500.00 to $700.00 income out of which all expenses of labor, grain, teams, taxes, repairs and living must come.

This was the history of back farms in New England, where mine was located, and was the history for large areas, but not always true of locations near cities. I dropped a good salary as a College President and staked the family fortunes, where others had lost, on the belief that first, by combining intelligently science with art; secondly, the sacrificing of the present to the future, both in the interest of the latter days of life and the future life of the family; and thirdly, a deeper and broader farming, or in intensive and extensive farming, would justify the change. Your secretary asked me to tell the story of the farm. As some good can come out of it to you, I will do so with little reserve.

I have already generalized on one and two, and in a measure on three. The trouble with our New Hampshire farming was that it lacked volume enough to secure the living of the hour, and was hopeless without more output. I do not plead for large farms, but the large *use* of farms. Volume must be had by either depth or breadth; the former should precede the latter, and the latter expand to the full size of the man and no further.

The New England farmer will not average to hold more than thirty or forty acres of field land out of a farm of one hundred to one hundred and fifty acres. His is narrow farming, without depth or intensity. Your farming is broad in acres of tillage, but of small volume, through lack of intensity. It is broad on soil spoliation, of natural fertility, which you too unthinkingly cream.

Returning to the new agriculture, based upon the union of the extensive with the intensive, what might a New England farmer hope for? Let us suppose, by the clearing of the better parts of his rocky pastures and woods, his forty acres of tillage is extended to eighty acres, and that these are intensively handled to the last acre, that the farmer, in the language of Carlyle, gives "the utmost that is in thee," and to the end that the economic utmost in each acre is secured. What, then, can be realized?

I use a rotation of eight years in which every tillable acre is manured every year, and all the acres together are on the upgrade each year.

On the second round of a farm in fair condition at the start (my farm was exhausted, economically speaking), the crops should be as follows:

	Dollars.	Tons.
Eight acres of corn for silage, treated with 10 tons manure and 600 lbs. chemicals, in air dry, equivalent		40
Eight acres oats and Canada peas, treated with 600 lbs. chemical fertilizers per acre		24
Eight acres in clover, treated with 500 lbs. mineral chemicals		32
Eight acres potatoes, treated with 8 tons chemical fertilizers, 2,000 bushels at 60 cents	$1,200 00	
Eight acres Hungarian and some grain crop treated with 10 tons yard manure		24
Eight acres timothy treated with 500 lbs. chemical fertilizers, 24 tons at $18.	432 00	
Eight acres timothy treated with 500 lbs. chemical fertilizers, 24 tons at $18.	432 00	
Eight acres pasture, treated with 500 lbs. chemical fertilizers		
Total	$2,064 00	120

One hundred and twenty tons hay, 15 per cent. shrinkage in the mow and work stock supply out will keep 45 cows. These, in my back town, 85 miles from Boston, will give $100 per cow for milk for Boston market, by good feeding, or $4,500, or a total cash income of $6,564, aside from house, orchard and garden income. Petite low pressure farming with hopeless income gives way at once to one of possibilities. Forty dollars per arable acre should pay all costs.

The new farming is one of greater intellectual motion and elevates the social status of the farmer. It involves capital and employed labor which has a similar influence. The greater play of intellect and larger volume of returns, with less of personal muscular work, and a business more executive in character, is more attractive to youthful ambition than one limited by the dull routine of one man-power farming.

The average quarter section of land not the farms of those present having a wider outlook than absent farmers, but of the average Missouri farmer, whose crops are reported at 26 bushels of corn, 12 to 13 bushels of wheat, and 25 to 26 bushels of oats, will not give an income of $1,000 total, out of which comes a long list of running expenses, aside from the family bills. This leaves little, very little, for the bank.

What are your possibilities? I used a six year's rotation when handling your college farm. What ought a farm to do in such a rotation?

20 acres corn equal in silage to	120 tons hay.
20 acres to oats and Canada or cow peas or some protein food	60 tons hay.
20 acres clover	80 tons hay.
20 acres wheat, 800 to 1,000 bushes at 80 cents, $640 to $800	
20 acres timothy	60 tons hay
20 acres timothy	60 tons hay.
	380 tons hay.

I will not attempt to say what rotation you shall have nor how you shall use the crops other than that they should, aside from selling wheat, be fed on the farm, and the solid and liquid manure returned to the land. In a general way, nitrogen-gathering crops, such as clover, peas, soja bean, or some other nitrogen gatherer, should enter into it, not only to enrich the farm, but to balance the feed ration; that clover must precede wheat to supply the nitrogen so hard for wheat to get, and so costly for you to buy as to be prohibitive; that probably floats, for a soil poor in phosphorous, may be added in lieu of the soluble phosphoric acid where the soils are rich in organic matter or naturally acid. Pursue constructive farming rather than destructive farming. Build character in lieu of dwarfing it by the ever-narrowing process of declining farming. Do not permit yourselves to think in small yields or results. The truth is, you have unconsciously come to lean on a soil naturally rich, but not capable, as no soil is capable of maintaining long, great returns without great art in its use.

No soil ever has or ever can maintain virile man unaided. You are keeping it just up to or slightly ahead of your bare necessities, while you should keep the level of returns ahead of the requirements of a refined living, as exemplified in home life, social life and public life.

But to return to the story and lesson of the speaker's farm. I was told, there and here, that labor could not be afforded. Then, if you cannot afford the lowest priced man labor of the markets, the muscle worker, how can you afford to use your own labor? Only as labor is used is wealth accumulated, and no man ever became rich or ever will become rich in industrial pursuits by his own unaided muscle. It was said there, and is said here, that capital cannot be afforded in farming, except in the minor key. Then are we achieving living as laborers, and are rightly classed as such by many publicists. But, my friends, capital is the foundation essential of a successful business, and should be used to its maximum.

With us machinery was classed out on our narrow farming; yet machinery is the right arm of industrial achievement, and it lifts us out of the purely muscle-working class; and we, in the east, who admit that it can not be used successfully, doom our agriculture to ignominious failure in competition with your mechanism. So I fitted my fields for the free play of machinery, removing hosts of rocks. Chemical fertilizers were generally held with us to be stimulants, in the end empoverishing the soil, and to be used only as crop starters. Tillage was but eleven per cent. of the arable area, as faith did not include chemicals as profitable plant food. Here you have nearly 89 per cent. of field area under the plow.

Throwing all the traditions of the east to the winds, and burning bridges behind me, I began the free use of labor (now employing fifteen men), of machinery of chemicals (now using 80 tons yearly), of tillage (having 165 acres in plow land crops and more to follow), and of the use of all my own capital, and much borrowed money. Farms have been added until the home farm is 932 acres and pasture land on mountain sides, 12 miles away, 1,000 acres. Some $15,000, true to my preachment, has been put into permanent improvements, as much more into personal property, much of the former in clearing and fertilizing lands. I began with an annual expense account of $9,000 in increased personal property and running expenses and have run it up to $15,000, with an income of $3,000 for the first year, increasing yearly until it has passed the expense account. This, in a rural town, having a constantly decreasing farm population, and constantly reducing farm values, until the present, when values have become stationary, with a leaning towards the return tide. I epitomize without the sense of boasting. I am here in the interest of a more virile agriculture, and want your confidence, and must have it before I can hope to aid you.

The elements of the farm success are found in its philosophy as a system, in its construction work for the future years, and in the free use of all the elements of soil fertilization and conservation at command. In the rotation itself is found a large economy of men and teams. It so runs that the teams and men in our short seasons are kept busy the year round. It has no hurried time and no time when labor is not at economic work. Seeding lasts from earliest spring till mid-June, and harvesting from mid-June until the final frosts of fall; while in the winter are the herds to care for, manure to draw, hay and potatoes to go to market, fifteen miles away, chemicals to draw home, wood to get up for the tenants, etc. This economy in the use of men and horses reduces the acre cost of each to be charged up to the crops. It aids in settling the labor problem by placing in cottage homes, rather than in my own, the laborer's family and in making him a more interested employe. You say here, as with us, that you cannot get labor. This means, you will not give them a chance to live with you by steady work and a home and the pay that the industries do. You can afford it, or you cannot afford to farm. But the labor must be based upon a more comprehensive agriculture.

I have said that the progress of agriculture is the measure of the world's progress. Crops are the measure of farm progress, or success and available plant food is the measure of crop growth. On this corner stone I rested in the final analysis my faith or hope in the successful outcome of my farm venture. Be not deceived, on this rests your future, and it will fare ill or well with you as you measure up to this truth. I know well the economy of your system of crop management and of stock feeding, yet I am impressed still, as of yore, while with you, that the harvesting in wholesale and orderly of all your crops, while at their best, and the orderly distribution of the completely saved offal, both solid and liquid, to the crops in regulated amounts associated with a wise rotation, would result in such an increase of crop output as to more than justify the costs.

My Yankee neighbor farmers had narrowed their tillage areas in response to the call for their boys and their money to develop the great west and to found in nearby cities the new and the reorganized industries growing out of the applied sciences. That narrow farming remained after its necessity had passed away, as a habit of mind and as a failure to perceive the source of plant food requisite to maintain broader tillage. No manure, no crops, in New Hampshire. Plant food was the crux of the situation. I sought it in five sources:

Rotation of crops was the first. Nature rotates crops, not as an accident, but in obedience to a fixed law. Observation in all ages has taught, tutored and educated man the value of rotation. On your State farm, just out here, in a four years' rotation trial, I found that wheat after wheat gave on unmanured area 13.91 bushels; wheat after wheat manured with six tons annually, gave 24.28 bushels; wheat in unmanured rotation gave 30.10 bushels, while wheat in a manured rotation gave 38.08 bushels. In these trials the value of rotation exceeded the value of manuring. This gain grows out of the laws of plant growth and soil conditions or natural laws. What are some of these laws or conditions? I cannot discuss them, but enumerate a few. Plants have different leaf development, affecting feeding habits and vaporizing powers, on the later score varying the moisture of the soil by a very large and vital amount. They root at different depths and feed on varying areas of the soil. They have each varying root weights and composition, passing from 2,000 pounds for grain crops to 8,000 pounds for clover, each having varying powers of gaining from soil and air, the elements of plant food. It is obvious that heavy rooted plants and nitrogen gatherers, like clover in the decay of roots and stubble, may feed plants like wheat that have low power to gain nitrogen, from the great store of this material in their roots. Three good crops of wheat can be got from the decay of clover roots. Thus, too, a plant with great power to get potash feeds one of low power. No two plants take the same ratio of plant food from the soil, potatoes gaining 35 pounds of potash to 11 of phosphoric acid. Wheat requires more phosphoric acid than potash. Plants each have their insect and fungus enemies both above and below ground, and the continuance of a crop multiplies these enemies in the soil used until, though unnoticed, they impair crop yields. I need not multiply reasons nor detail data as facts in abundance unite with philosophy in proclaiming rotations as of very great importance in a wise course of farming.

Secondly. I make much of regulated tillage. "Tillage is manuring" is an epigrammatic statement that has come down the agricultural ages since the divine command to "Till and to keep it." One of Job's moral virtues, as claimed by him, was that of good plowing. Virgil, the world's greatest epic poet, said, "Vex the earth with continual hammerings." Tull, first philosopher of agriculture, taught the adequacy of tillage as a source of plant food, and Roberts is still proclaiming the power of tillage. Modern science explains its success. The dead air held in the air spaces of gross land reduces to the minimum the circulation of air in the soil. Hence it was that Sturtevant found but 3-10 of a pound of nitrogen per acre under grass, while the open soil frequently tilled for the summer showed 210 pounds, resulting from the bacterial activity and oxidizing effects of a freer circulation of air in the opened soil. "The tooth of time" had opportunity to apply its teeth.

But Snyder's data, showing that a virgin prairie soil, having 16,000 pounds of nitrogen, had lost nearly one-half of it in nineteen years of continuous wheat crops, shows not only the tremendous influence of tillage in plant food solution in the soil, but the supreme folly of the western non-rotation farming. In New England we till eleven per cent. of our soil, and invite to the minimum the aid of nature, while here you till 89 per cent. and invite the rapid burning up of the organic matter of the soil.

This wasted nitrogen, if returned in fertilizers that you are now beginning to buy, will cost you 20 cents per pound. You are selling your childrens' future, and the State's degree of greatness in continuous tillage. I strike the medium between the eastern passive tillage and your excessive tillage. Let cover and semi-cover crops follow tillage crops to take up what the tillage crops induce in increased soluble plant food, and stop the too rapid soil solution, especially of organic matter. This is one of the functions of a good rotation. To this end, I alternate tillage, cover and half-cover crops. But tillage is distinctly used as a source of my greatly increased need of plant food for our New England soils.

Thirdly. I use irrigation as a source of plant food. In times of drouth, water is very much the measure of crops. I now refer to irrigation as a source of plant food. All waters carry such food in solution. The soil has the power of removing these materials from water and appropriating them. Some 300 pounds of plant food annually goes into my soil by irrigation waters. Your opportunities of irrigation in Missouri are greater than you dream of, but I do not press the point.

Fourthly. I use muck or vegetable matter formed under water and subsequently appearing as peat and muck beds. Little of this is found here. I note in passing that this material is rich in nitrogen and poor in potash and phosphoric acid. For the first time, so far as I know, I introduced the habit of using with muck those two deficient minerals, and find the results encouraging.

Fifthly. I rely on the soil robbers of the west and the south for their protein foods to balance the ration of carbonacious northern clime crops of my section and to perform the second and equally valuable function of feeding my soil the nitrogen it needs. On my return from the west, in looking for the cheapest source of nitrogen, I found it in cotton seed meal, rather than in the fertilizers of the markets; so I used a car load of this feed as a manure and chiefly for its nitrogen. Now a ton of rich cotton seed meal contains 130 pounds of nitrogen and $5.00 worth of potash and phosphoric acid. If any of you are using ordinary mixed fertilizers of the markets, as some of you are beginning to do, and are dreaming of doing, you are paying, or will have to pay, 20 cents for each pound of nitrogen in it, or $26 for an amount equal to the nitrogen contents of a ton of cotton seed meal. This is aside from the phosphorous and potash contained in the cotton seed meal. The cow takes out but about 20 per cent. of these materials, and, of course, leaves 80 per cent. as offal. For thirteen years I have bought only protein foods using these as one means of feeding my farm. Not a ton of corn meal of the 175 tons annually bought, goes to my cows, except for fattening off the very few that are winter fattened. Some corn is fed horses. Roughly stated, a ton of bran is worth two tons of corn meal for manuring, and a ton of linseed is worth something over three times, and cotton seed meal four times as much as corn meal as a manure. Among other rich manure-makers are gluten feed, brewers' grains, distillers' grains and middlings. Take the long look ahead, and fat your farm through your stock and the sale crops of the farm of the other fellow.

Sixthly. I probably should have hesitated to place the fortune of the family on land that gives back but little of annually available fertility, unless I felt sure that an abundant supply of plant food could be secured in unlimited supply. I had the love of breadth of operation and a large opportunity for the future of the family on the old farm home. As my years were passing, being then 47, I desired to do, and had to do, what I desired to do quickly. This supply I looked for in chemical fertilizers. I, on the basis of scientific inquiries and personal experience, and Law's and Gilbert's half century of successful and continuous field use of chemical fertilizers against yard manure, held chemicals to be real plant food, and not as they were held by farmers, to be mere stimulants, operating at the expense of the soil. I believed they could be used profitably for staple crops as substitutes for manure. In this position, I was out of accord with the farmers in New England and of the country generally. On this belief, as a corner-stone, I swung loose from traditional farming in the east and started on an extensive, intensive farming, borrowed money being involved. This year, some one hundred tons, or over three thousand dollars, will be used in chemical fertilization. These chemicals are being successfully used, one field having had no other fertilizer for 30 years, and shows a favorable balance sheet.

This means that the knot that binds us to petite farming in the east has been cut, and that there is no limit to the area that we can till but that of our ambition and capacity. It has taken some care to prevent the former from outrunning the latter.

I use the original sources of plant food rather than the mixed foods; that is, buy nitrate of soda, blood, tankage, the potashes and various sources of phosphorous and mix them to meet the needs of my land, and the crops grown. To the latter directions, as determined by the Ville scheme of plant analysis of soils, I ascribe much of the successful use of artificial fertilizers.

The time has not arrived when you can afford the indiscriminate use of these sources of plant food. The nitrogen, phosphorous and potash in 100 pounds of corn, will cost you on the market, 43 cents, or close to the sale value of your corn, as an average of a series of years. But this is not all; it will cost you more than this to grow the stalks on which the 100 pounds of corn are grown. I need not have alluded to this—did not the full, able and continued discussion of chemical fertilization in the "Rural World" of recent date demonstrate that you are using, and more seriously thinking of using, fertilizers on an increasing scale? Wheat, having a higher sale value per pound, may warrant on some soils requiring only a one-sided treatment, or one or two of the elements of plant food, their use. Dean Waters tells me that the study of your soils by the college, has shown a very general deficit of phosphorous. This costs but a little per pound, and is required by plants in only a relatively small proportion, and its use would certainly be warranted on the premise that phosphorous is the weak link in the chain of soil elements of plant food for the soils of Missouri. But phosphorous, I have found in thirty years' inquiry, despite the opposite view until lately held by chemists and propagated by fertilizer manufacturers, is available from floats or insoluble phosphates. My acid soil dissolves it, and your rich humus soil will do the same work. Here is the hope of your wheat farms, and, in fact, your reasonably safe way to lift the level of your soil fertility by strengthening this weak link.

I regret that in this summary of the leading factors essential to successful farm management, I have been unable to detail and specialize more. Broadly re-stated, I have based successful farm management upon mental force, upon far-reaching farm improvements, such as are likely to come only in the permanency of the family line on the farm, and upon the application of capital and labor to land as applied to other industries in extent sufficient to give a greatly increased volume of crop returns to the full capacity of the farm and the man associated with the farm.

My special appeal to you in this relation is to cease thinking in small crops and small results, when your farms have undeveloped capacities far above those realized upon. With lands capable of forty to fifty bushels of wheat per acre and other crops in like ratio, never permit yourselves to think in the low and discreditable levels of your State averages. Cease leaning on nature to any extent, merely dragging after the growing demands of a widening culture, as you are competent to look sharply into the great and undeveloped resources of your farms and lead nature out and up, rather than let her drag you down with receding crops.

In conclusion, I want to thank my friends for their very patient attention to my address, and their cordial greeting. I desire to make a special note of the large sprinkling of young men present, a rare event at farmers' meetings. The new agriculture requires a new or a trained race of men equipped with philosophy, art, energy, a broader ambition and a deeper love of nature, absorbed more with love of family and of the State, and less self-centered than the old race of farmers. It is not wise for me to select your industry. If you desire to enter a vocation that will call out your highest intellectual activities and occupy them most broadly, that will unite with a bread-winning industry the one in its newer intellectual development most fascinating because ever dealing with the forces of nature, that will give the finest physical and moral training, that calls out the mercantile and executive faculties, and that gives permanency to the family and its social status, and longest life, then, in the language of Parton, select agriculture, if "You are big enough."

Wishing you and your State a happy and strong future, I carry back to the reluctant, abiding and beautiful hills of New Hampshire a very pleasing memory of this greeting of yours and of the growth of your educational system, especially as exemplified in your State Board of Agriculture and State College of Agriculture, and evolving primary and secondary agricultural and educational work.

WHAT THE ABERDEEN ANGUS BREED HAS DONE TO IMPROVE THE BEEF CATTLE OF AMERICA.

(Geo. Kitchen, Gower, Mo.)

This breed, which is now so well known in the United States and Canada, originated in two small countries (Aberdeen and Angus) in Northeast Scotland. So far as can be learned, the polled type always existed in these countries, although it is known that about the time marked improvements began (1808), two fairly distinct types existed. The smaller type was of a black color, very hardy, and strong in polled tendency, for we learn that three consecutive crosses of Shorthorn blood could be made without disturbing the polled characteristics. The other type was also polled, but larger, and inclined to be brindled or reddish brown, on the back and in the flanks. These two types of polled cattle were undoubtedly blended to considerable extent by the farmers of the district.

In 1808, Hugh Watson of Keillor, whose name is imperishable in Angus history, started the work of definite improvement of the polled cattle of Northeast Scotland, by selecting from his father's herd six of his blackest and best cows and a bull (all polled). To this nucleus he added the same year ten polled heifers and a bull, purchased in Trinity Muir market in Brechin. These sixteen cows and two bulls formed his foundation herd, and from this foundation he built up, by skillful selection and mating a herd, of which Wm. McCombie later wrote, "There is no herd in the country which is not indebted to Keillor blood." McCombie also says, in his work on cattle and cattle breeders: "I may notice some of the noblemen and gentlemen who have distinguished themselves as breeders of Aberdeen and Angus polled cattle. Among them the late Hugh Watson, Keillor, deserves first rank. No breeder of polled Aberdeen and Angus will grudge that well merited honor to his memory. We all look up to him as the first great improver, and no one will question his title to this distinction."

Watson's great work as a founder was ably seconded by the work of McCombie himself as an improver and advertiser of the breed, and many other good Scotch cattlemen were worthy contemporaries of these two great breeders and showmen, but the brief time at my disposal forbids mention of these men.

I have spoken of the origin of the breed, and have done so with a purpose, which would be incomplete did I not also speak of the conditions under which this great breed arose. Northeast Scotland is a hardy land rather rough and none too fertile. Much of the land in Angus and Aberdeen is arable, yet much of it is hilly; and nearly all of it is more or less rocky. The climate is damp and cold—not cold as we know it (for it seldom gets cold enough to drive the mercury to zero mark), but cold because of the dampness of the sea winds, so that the rawness of the winter winds is as hard on a man and beast as our coldest winter weather. Corn is not grown there, and while oats and barley thrive far better than they do with us, their value is so high that the canny Scot had need to study closely the art of feeding, for there could be no waste without want to follow. Straw and roots make up the bulk of the rations, therefore, and poor feeding beasts (those that did not do well in proportion to the feed given) were not long kept in the herds, for in the judgment of the careful Scot, they were "poor beasties," not fit to perpetuate the race. Furthermore, it was quickly seen that some beasts were vastly better killers than others, and as the drovers were not slow in impressing this fact on the breeders, those animals with poor conformation, and those that were poor feeders, were speedily weeded out of the north country herds, for the very good reason that they were not profitable, and in a land where money was hard earned they had no place.

What I have said of the origin and land of the breed, I have said for the purpose of bringing out clearly the following facts:

1. The breed originated from polled stock of ancient lineage and purity of blood.

2. It originated in a district where climatic conditions are as severe as in any part of the United States.

3. It originated in a district where the food, though good, was high-priced, and where it was harder to make a living than most countries. This made the breeders careful to select only the most profitable beasts—those that were good feeders, and that would bring a top price when ready for the block. Utility was ever kept closely in mind. The unprofitable animal was a "bad beast," no matter how well-bred he might be from a pedigree standpoint.

These factors combined to enable the breeders to produce an animal of great value from the producer's standpoint, for they were hardy and vigorous, were good feeders, and were of the type which found greater favor with the slaughterer. To these good points the breeders had settled on the polled head and black color as distinct breed characters, and within less than fifty years made the breed so good that it was winning championships in competition with other breeds of longer standing.

The aggressive advertising policy followed by Watson, McCombie, and their contemporaries, by 1860 had its effect in Scotland, where the breed grew rapidly in popularity. By 1873 its fame had spread beyond the Atlantic. Grant of Kansas, in this year, imported three bulls. The Ontario Experimental farms followed in 1876 with the importation of two cows and a bull, and in 1878 Anderson and Findlay imported five cows and a bull. This was the year of the Universal Exposition in Paris, where Mr. McCombie was awarded a prize of honor, offered by the French government, for the best group of cattle, consisting of one bull and four cows or heifers, open to competition from all breeds foreign to France. He added to this by winning the prize offered for the best group of beef-producing cattle in the entire exhibition. Inasmuch as there were 1,700 head of cattle at this great show, the winning of these high honors had much to do with bringing the breed into world-wide notice, and undoubtedly was one of the very strong contributing factors in bringing the breed into such sudden prominence in America.

Importations were made in 1879, 1880, 1881, 1882 and 1883, and it is estimated that from 1880 to 1883, inclusive, over 2,000 head were imported to and distributed throughout the United States and Canada. Up to date there has been 125,000 animals recorded by the American Aberdeen Angus Breeders' Association. The association has a membership of 1,300, and each year the records have shown a decided increase in number of registrations and memberships over the preceding year.

The influence of the Aberdeen Angus on the beef cattle of the United States was from the outset, in the direction of greater utility. Their low set, blocky, thick-fleshed forms commended them at once to the slaughterers, as was proved by the fact that in the first carcass contests they were entered in, in this country (1884, Chicago Fat Stock Show), they won prizes in both the two-year old and yearling classes. The polled head has ever been a factor of value, for it is well recognized now that polled cattle feed more quietly and satisfactorily, ship better and sell higher than cattle that are otherwise equal, save for the horn they carry. Indeed, this is so well known that most feeders of experience dehorn their young horned cattle before putting them on feed. The early maturity of the breed also commended it to practical farmers, and its hearty feeding qualities, developed under the careful Scotch management, aided in bringing the breed rapidly into public notice.

It may be that I have wearied some of you with this review of Angus history. If this be the case, I beg pardon, for I have tried to dwell on it only to such an extent as seemed necessary to the subject at issue—"What the Angus had done to improve the beef cattle of America."

Turning from the review of the past to more recent history, I desire to ask you to briefly consider with me the record of the past eight international live stock shows.

Of the eight grand championships awarded, two have been won by pure-bred Angus steers and two by high grade Angus steers.

Of the eight reserve championships awarded, four have been won by pure-bred Angus.

Out of eight championships for the best carload of fat steers, six have been won by loads of high grade Angus steers, and the breed has won its full share of the reserve championships in carload classes.

Out of eight championships offered in the dressed carcass competitions, four have been won by pure-bred Angus and three by grade Angus beasts. Full details of the breeding of all the prize winners at the first international are not available, but out of the 70 prizes awarded in the carcass competitions in the past seven international shows, Angus or high grade Angus beasts have won 38, or more than one-half of all prizes offered in the carcass tests in the past seven years. When to this is added every championship offered in the carcass classes in the same time, it is evident that the popularity of the breed in the individual show ring classes, and in the carload lots, rests on the most solid of foundations—*real value on the block.*

An inquiry among the butchers and beef experts reveals the fact that the chief reason for the high popularity of the Angus or Angus grade steers are about as follows:

1. They kill as high a percentage of dressed carcass as any of our beef breeds.

2. The carcasses are well proportioned, carrying as high a proportion of weight in the valuable cuts as any breed.

3. The fat is more evenly and uniformly distributed, especially in two-year old cattle, than in the case with either of the other breeds of the same degree of fatness.

4. The percentage of lean meat, or flesh element, is higher, in proportion to the fat carried, than in either the Hereford or Shorthorn cattle, and yet there is always in properly fattened Angus an abundance of fat interspersed through the lean. The ideal beef carcass is one very rich in lean, with plenty of fat marbled through the lean, and with but a moderate covering of outside fat—say one-half inch of outside fat evenly spread over the carcass. The other beef breeds of cattle marble their lean well, but the percentage of lean meat to fat does not run as high, on the average, as in the Angus breed, and it is this characteristic (a wealth of natural flesh) that the Angus has contributed in greater degree than any other breed to help improve the beef cattle of America.

Our breed possesses as great hardiness and ruggedness as is possessed by any breed. It has been bred from the outset for early maturity and good feeding qualities, and may fairly be said to possess these desired attributes in as high degree as any breed. To all these, which the Angus has contributed in common with the other breeds, it has also brought in somewhat greater smoothness of finish and a greater wealth of flesh element than any *breed on earth;* and it is this that the Aberdeen Angus has contributed to improve the beef cattle of America.

EARLY ORGANIZATION AND DEVELOPMENT OF THE AMERICAN HEREFORD CATTLE BREEDERS' ASSOCIATION.

(C. R. Thomas, Secretary.)

The corporation known as the American Hereford Cattle Breeders' Association was organized at a meeting of a few Hereford breeders held at the Grand Pacific Hotel, Chicago, Ill., on the 22d of June, 1881, the call therefor having been made at the instance of Mr. C .M. Culbertson. The officers elected at this meeting were: President, C. M. Culbertson, Chicago; vice-presidents, A. H. Swan, Wyoming; W. H. Todd, Ohio; Wm. Hamilton, Michigan; R. W. Sample, Indiana; B. Hershey, Iowa, and Wm. H. Sotham, Illinois; treasurer, Adams Earl, Lafayette, Ind.; and secretary, T. E. Miller, Beecher, Ill. The board of directors were J. M. Studebaker, A. H. Seabury, W. S. Van Natta, N. Abbe, G. S. Burleigh, A. D. Raub, H. Norris, Chas. Gudgell and E. R. Price.

The objects and purposes of this organization, as set forth by resolution adopted at this meeting, were to promote the interests of the Hereford breed of cattle, and to secure their introduction and trial more generally throughout the beef-producing sections of the country, as they believed that a fair and impartial trial of these cattle by the side of representatives of other beef breeds would establish their superiority as profitable beef producers, both as grazers and in the stalls, in ability to withstand hardship and in quality of product.

At this time Volume 1 of the American Hereford Record was in print, the same having been published by the Breeders' Live Stock Association of Beecher, Illinois, an organization of which Mr. T. L. Miller was the dominant spirit.

A committee of members of the Association, composed of C. B. Stuart, G. S. Burleigh and W. S. Van Natta, was appointed at this meeting, to examine into the entries admitted to this volume, with a possible view of later purchasing the same, together with the copyright that Mr. Miller had procured.

The second meeting of the Association was held in November, 1881, in Chicago, at which time the officers and directors chosen at the previous meeting were by resolution adopted continued until the next annual meeting, which was to be held in November of the following year.

The roll-call of members at this meeting showed a total enrollment of thirty-four breeders, from eight different states and territories, of whom there were about twenty-five present on this occasion. The importance of the fat-stock shows as a medium of getting the merits of the Hereford before the public was duly recognized, so the principal business of this meeting was to arouse an interest and some degree of enthusiasm among the breeders, such as would secure representative exhibits of Herefords at these shows. To this end pledges were asked and obtained from the members present for the production of steers, both pure-bred and grade, that would be prepared for these exhibitions.

The third meeing of this Association was held November 22 and 23, 1882, at the Sherman House, Chicago, and Mr. C. M. Culbertson was continued as president, but some changes were made in the directory.

The chief matter of business and interest before this meeting was the promotion of the exhibits of Herefords at the fat stock shows, and it was resolved to raise a fund of $2,000.00 for special prizes for these cattle at the next show. The castration of some twenty pure-bred calves and a hundred or two grades was promised by the members present.

The fourth meeting of this Association was a called meeting, and was held at the Sherman House, Chicago, February 28, 1883. The business of this meeting was to consider a proposition from Mr. T. L. Miller to sell to this Association the Hereford Record, two volumes of which had then been issued. After a lengthy discussion of the matter, a deal was finally effected between Mr. Miller and a committee of the Association. To provide the funds necessary to pay for this, a per capita assessment was levied, by resolution adopted, upon all the Herefords owned by the several members of the Association on the 1st day of July, 1883. Under this resolution eighty members reported their herds for assessment for this purpose, and the aggregate number was a little over 2,300.

The committee on special-prize fund for the next fat stock show reported that they had secured the $2,000.00 for this purpose, and recommended a classification for same, which was approved. It was now deemed necessary that this Association should have a corporate existence, and Messrs. C. M. Culbertson, W. S. Van Natta, C. B. Stuart, G. S. Burleigh and T. L. Miller were appointed a committee to incorporate the same under the laws of Illinois, before the next annual meeting.

The fifth meeting of the Association was held at the Sherman House, Chicago, November 15 and 16, 1883, with President Culbertson in the chair. The committee on incorporation reported that they had duly made application for incorporation, as directed; that a certificate thereof had been granted them on the 10th of November, 1883, and that the Association was now a corporate body; so it may be said that the present American Hereford Cattle Breeders' Association was born at that time.

Mr. W. S. Van Natta, now of Fowler, Ind., was made president and a set of by-laws and rules were adopted. At that time, there was, as before stated, something like eighty members of the Association owning in round numbers about 2,300 head of registered cattle.

From this brief narrative of the most important actions and the principal actors in this organization of the early breeders of Herefords down to the date of its incorporation, and its purchase of the Hereford Record, but little conception can be had of the difficulties and discouragements with which these pioneers had to contend in laying the foundation of the imposing structure that has since been reared thereon. In the first place, these breeders were but few in number, less than a score being present at their first meeting, and but a few more at their second gathering, with a total enrollment at that time of only thirty-four members. In the second place, they were, it might be said, in an enemy's country, surrounded by hostiles at all times. They could then get no encouragement or favorable recognition from the agricultural or live stock press, no tolerance at the hands of fair and fat-stock show managers, and no decisions without manifest prejudice at the live stock shows. It was no unusual occurrence in the early experience of these pioneers to have the judges at the live stock shows award the prizes to another breed without ever examining or coming anyways near the Hereford exhibits. In the great live stock markets of the country, where now it may be said the friends of the Herefords are legion, there were none to do them reverence —not one to speak their praise. These conditions were such as would have brought discouragement, with abandonment of their efforts, to the most of men, but not so with these stout-hearted pioneers. Defeat only stimulated them to greater efforts, and mistreatment was but fuel to the flames of their determination to succeed. The present status of the cause of the Hereford is due as much, if not more, to the indomitable courage and persistent efforts of its breeders than to the surpassing merits of the breed. While truth is mighty and will prevail ultimately, yet its ends are sometimes sooner reached by judicious efforts in the direction of its accomplishment.

A few veterans of the early days of the Association are still in the ranks and doing yeoman's service for the cause.

Comparatively speaking, but few of the members of the Hereford Association of today know the origin or the early action of the plucky pioneers, who first made a breach in the Great Chinese Wall of public popularity that surrounded a certain other breed of cattle.

The growth and prosperity of this association since its organization have been something marvelous and are certainly a compliment to its management. The number of shareholders in the same is now about 3,700 breeders, and a very conservative valuation upon the cattle owned by these at the present low price, is about 12 millions of dollars.

The available assets of the Association are today about $65,000, and in addition to this, about $160,000 have been distributed among the breeders as premiums to cattle exhibited at the various fairs and fat stock shows throughout the country.

It has published thirty volumes of the record, containing 285,000 entries. It has established and maintained an office for keeping the records of the Association that for promptness and dispatch in attending to business, for care exercised in detecting and preventing errors or frauds in pedigrees for the amount of work performed for the cost thereof, and for systematic care and attention to the business and interests of the Association, is without a superior, if it has an equal, in any similar organization.

In addition to the foregoing, it was the first to inaugurate the holding of great breeding shows and combination sales under the auspices of the National Association of Breeders, the first of these ever held being for Herefords and under the auspices of this Association at Kansas City Mo., in 1899, at which there was gathered the greatest congregation of fine cattle of any one breed the world has ever seen. From this show sprung the present Great American Royal Live Stock Show, which today has no equal in the world as a breeding show.

No concerted action or especial booming has been indulged in, but the Hereford breed of cattle has largely upon its merit forged itself to the front, until today it occupies the very foremost rank among all beef breeds.

In all of the range country, where twenty-five years ago there was little to be seen except long-horned, long-legged, decidedly common cattle, today marks such a change that it is almost beyond belief. The long-horned and long-legged animal has disappeared, and in his place is to be seen thousands upon thousands of white-face cattle, which goes to show that the Hereford bull has been doing his work, and doing it well.

Many trials have demonstrated the fact that Herefords will thrive in both hot and cold countries, where other cattle are at a decided disadvantage. There is no weather too cold that the Hereford is not out hustling for something to eat, and there is no weather too hot, that he shows much discomfort from same. For early maturity the Hereford has no equal. He will put on more flesh with the same amount of feed and in the same time than any other animal, and in the market always commands right at the top price, more often than any other breed topping the same. He has multiplied and replenished the earth, and has gotten into all corners of the same, and each day is growing more in favor.

A few years ago, at the Chicago Fat Stock Show, comparatively few Herefords were to be seen, but at the Great International Show, which has just come to such a successful close, there were more carloads of good Herefords exhibited than all other breeds combined. This in itself speaks volumes.

If you are ever asked the question what breed of cattle is the most profitable to handle, let your answer be the Hereford, and you will have answered properly.

THE SHORTHORN.

Hon. B. O. Cowan, Chicago, representing American Shorthorn Breeders' Association.)

From what you have been taught as students of the Agricultural College, from what you have learned as an Agricultural College, and as agricultural students on the farms of Missouri, I think you will agree with me when I say that there is no system of agriculture that can be permanently successful that is not founded upon live stock. I don't believe that statement can be successfully contradicted. It is quite important, then, for men who are engaged in agricultural pursuits to know what is necessary in order to conserve the fertility of the soil of their farms; then, as live stock is a necessary part of agricultural life, the question is, what kind of live stock shall I breed? It seems to me that that is a question which must be settled by each one for himself. Briefly, it ought to be that particular breed of live stock for which you, as an individual, are best suited. Some men succeed in one and fail in another; some have tried one breed and made an utter failure, and have taken up another line, and made a great success of it. So you can not lay down any absolute rule that will conform to all cases. It is a matter of temperament, a matter of fitness, largely.

But I am supposed to confine myself to a discussion of live stock, particularly to cattle; and not only to cattle, but I will bring it down to the *beef* breeds of cattle, because with no other class of cattle have I had any experience. Then the question to determine is what particular breed of beef cattle shall we select. I am here representing the American Shorthorn Breeders' Association, having had a long experience, an actual experience, in the breeding of shorthorn cattle, and it goes without saying that you would expect me to speak in defense of shorthorns.

Admitting the very great merit of the competitors of the Shorthorn, admitting that not all of the merit in the beef form is comprised in the Shorthorn breed, giving to others due and just credit for the great merit they actually possess, we can still stand before you and claim that there is no breed, considering both the beef and milk-producing qualities, that is the equal of the Shorthorn. I believe that I am safe in taking that position. I believe that history and the facts of the present day management of the Shorthorn breed will justify me in taking that position, and I stand upon that record, that as a beef-producing animal, and as a milk-producing animal, the two combined, there is today before the American people absolutely no breed of cattle that is the equal of the Shorthorn. The Shorthorn is one of the first improved breeds of beef-cattle. The breed originated, as all students of the history of Shorthorns know, in a few counties in England in about the middle of the 17th century. The breed was improved by judicious farmers, and from England it was brought to America, and has been taken to all of the colonies of Great Britain, and from that start the breed has been more widely disseminated than any breed in existence. I will not weary you with a detail of importation. They came to this country as early as 1794. There were a few imported during the 18th century, but most of them from 1810 up to the present day, and during that time thousands of the best cattle that were produced in Great Britain were brought to this country and furnished the foundation of the herds that are now being produced with such eminent success and such great excellence by the American breeders of today.

The breed has its history in a succession of victories in the show yard. It also has its history as furnishing the most remarkable list of public sales of any breed of cattle in existence. In 1875 a sale of 85 head of cattle was made in Great Britain by Mr. ————, where they made the remarkable average of $2,839. A few days later Lord Dunmore sold 39 head, at an average of $3,510 a head; and one bull brought 4,500 guineas, the equivalent in American money of that time of $26,900. But the highest sale in all Shorthorn history—in fact, the most remarkable sale of all bovine history, was that made September 10th, 1873, at New York Mills, at which 109 head of Shorthorn cattle made the remarkable average of $3,504. That was a time, of course, when men had lost their heads, and some of them soon afterwards lost their purses as well, because at such prices as that it is a very, very rare thing that any man, no matter how judicious he may have been as a breeder, no matter how judicious as a feeder and as a fitter, no matter how judicious as a salesman, I say that very few men could hope to get prices out of cattle bought at such fabulous figures that would bring them a profit. I cite that not as an example to be followed, not that we hope ever to see such a sale as that repeated in Shorthorn history, but I cite it simply as a fact of Shorthorn history.

Until recent years the Shorthorn breed had practically no successful competitor. I am aware that the champions of other breeds will relate to you, and they have a right to do so, the long and successful list of prizes and championships they have captured in recent years at the International Fat Stock Shows of this country. We grant them that; we grant them the merit and the honors they have won, but in explanation of that will say that unfortunately Shorthorn breeders became indifferent to the matter of fat stock shows, and many of them have, in recent years, been attempting to win championships with steer calves that they thought were too indifferent to win out as breeders in their herds. Too many of them have made that mistake. Some men have gone forward steadily, showing a good class of steers, and have made a creditable record for the breed, but during the last 18 months a very encouraging improvement is perceptible. The Shorthorn breeder is wakening up to the fact that his competitors have been winning too many prizes in the fat stock classes at the recent Internationals, and that they must do something in order to give their breed a better standing in competition with those other breeds, and so they have set forth now with the determination of producing the right class of calves to feed for these fat stock shows, and whenever the Shorthorn breeders of the country, all of them, realize that that is a duty they owe the breed, and set forth in that work with energy, with judgment, and with persistence, we have reason to believe that the Shorthorns will continue to win championships in the future as in the past. Very much encouragement has been afforded us this last year by winning the grand championships at the International of 1907. We have the encouragement that we won the grand championship in the fat classes at Smithfield during the last great fat stock show there. We have, as an additional encouragement, the fact that at the Iowa State Fair, at the Minnesota State Fair, the grand champion steer was a Shorthorn; so that this is furnishing us more encouragement in these classes than has been accorded us during recent years, and it is to be hoped, and we may say with confidence, that if we only have such classes set forth in the fat stock shows as was presented at the last International in the younger classes of Shorthorns, we have every reason to believe that the Shorthorns will be successful in winning other champion prizes. In the matter of breed conditions, the Shorthorn stands absolutely at the head. Even our competitors, going through the classes of the magnificent Shorthorns, presented to the view of the spectators at the recent International, and for the three last Internationals, have, without any sort of qualification, commented upon the splendid show that was being set forth by the Shorthorn breed in the breeding classes. Now, then, when we take hold of the exhibition of steers in the fat classes with the same energy, with the same judgment, with the same persistence that we are showing in producing animals to be exhibited in the breeding classes, then we can hope to stand among the very best of those that bring the cream of their breed for exhibition at our great shows.

Another reason why I breed Shorthorns is their universal popularity. There is no question but what the Shorthorn is the favorite of the great mass of the farmers of America, and why is it? Because for more than a hundred years they have successfully met the trying conditions of an intelligent husbandry on our farms. They have been tried, and have not been found wanting.

Now, I want to speak very briefly about the *dairy* side of the Shorthorn. I have noted a few facts from a few Shorthorn cows where an accurate record has been kept. It is a very easy thing for a man to say, "I have a Shorthorn cow at home that will produce more than a cow which has been tested, and her record set forth," but when he comes to milking that cow and weighing her milk, then he may be mistaken. When a man says "My cow gives so many gallons," and he milks in a large pail, and does not count any off for an inch and a half of foam on top, he may be considerably mistaken. In these facts I will give you they are based, in nearly every instance, on actual weight:

Laura I won first prize in the Shorthorn Special International of 1906, giving a total amount, in 1906, of 9,052½ pounds of milk. She gave an average for seven months of 40 pounds a day. That's a pretty good record for a dairy cow.

Jenny Lee gave, in 1906, 10,484 pounds of milk. She gave an average for five years of 9,243⅓ pounds.

Henrietta Clay gave 8,665 pounds in a year, and her daughter, Henrietta Clay the II, gave 10,286 pounds, when three years old; another daughter, Redbird, gave 11,454 pounds in a year. Now, ten cows in this same herd gave an average of over 10,000 pounds of milk in a year; and the entire herd of cows (mature cows, above six years of age) gave an average of 9,107 pounds of milk. That is a herd owned in New York, and probably a good many of you could name the owner without my giving the name.

Mamie Clay the II in one year gave 13,232 pounds of milk, and 69 pounds of milk in a single day.

Kittie Clay the IV, the first-prize cow in the 30-day test at the Columbian, gave in 30 days 5,092 pounds of milk, an average of 53 2-3 pounds a day; and in a 31-day test in 1895, she gave 8,038 pounds, an average of 59¼ pounds a day; and in one day she gave 65 pounds.

Let me give one or two more instances, verified by actual measurement. The former Secretary of our Association, Mr. J. H. Pickerell, gives this record: Cape Louis, a cow he owned in his herd, died of milk fever at six years of age. She had raised four calves. One of those calves, when two years old, sold for over $3,000, and the record, without actually weighing the milk, is that that cow gave a great deal more milk than her calf would take when the calf was five or six months old. That's a remarkable record. You may say it is not accurate, and that we don't know what she would give, because it was not measured. That is true, but we do know that a cow which will give more milk than her calf will take, when five or six months old, is a remarkable milker. I had such a cow in my own herd when I was breeding Shorthorns in the northwestern part of this State. I had twin heifer calves that were shown as beef animals as calves and as yearlings at three fairs, one taking first and the other second at each fair. After they became two years of age they were put in the breeding herd. One developed into a remarkable milker, and when her calf was two months old, I have frequently milked 2½ to 3 gallons of milk more than the calf would take; that is, the calf was turned with the cow, and when it got all the milk it wanted and went away, the cow was then milked, and would give two to three gallons more than the calf would take.

Now, in regard to butter records. We have only a few instances where we have kept a record, but what we have are good:

College Moore, now owned by the Iowa Agricultural College, made a record by actual weight of 517 pounds of butter in a year. Florence, another Shorthorn cow, owned by the Agricultural College of Nebraska, made a record of 484 pounds of butter in a year, and during that same year a calf from her was sold for $200. That is a pretty profitable cow for a farmer to have.

I want to say here that I think the opportunities before the live stock breeders of Missouri are remarkably good. I want to say that most classes of pure-bred live stock are selling well today, and are profitable to handle—whether it be Hereford, Angus, Shorthorn, or Galloway, or what it be. If you will take them and breed them intelligently and feed them carefully, there ought to be a profit in them. There certainly is a profit to the Shorthorn breeder of today who is taking care of his herd, and who is improving his herd. Let me tell you the record of the public sales of Shorthorn cattle during 1907, where nearly 8,000 cattle were sold: The average of that entire number was $160.15, an increase over the average of the public sales of the preceding year of $16; and that $160.15 was about $25 higher than the average of the competing breeds in the beef line. That I speak of simply as a matter of encouragement to you men who are breeding Shorthorn cattle. Take them, then, continue to breed them carefully, give them intelligent care and treatment, treat them right and breed them right, and they will give you a fair return for your money.

Now, I want to say that it seems to me that it would be a fortunate condition of affairs in this country if we could only have father succeeded by son in the live stock business, as is done in Great Britain and other countries. I say, then, interest your son in breeding pure bred stock for various reasons: First, to keep him on the farm; next, that he may be your successor in the business. It would be a fortunate thing, indeed, if we had a law—not such a law as they used to have in Great Britain, by which the inheritance descended to the first born, but a law by which the energy, the zeal, and the skill of the father should descend, not to the first born alone, but to every son that he might have, and that this should descend to the third and fourth generations, so that there should, indeed, be a succession of great men in the business, just as we find a succession of great men in other countries, the son following along in the footsteps of the father. I want to say to the young men before me: Take up the work which your father has established; do not throw away the work he has accomplished, but step into his footsteps. Take the benefit, the advantage of the work he leaves in your hands and carry this work forward to a greater success. It seems to me there is a splendid opening for any young man to engage in the breeding of pure-bred live stock. It seems to me it ought to be his ambition to take his father's herd and hand it down to his own son better and stronger than when he received it. That ought to be the ambition of every live stock man. It was the ambition of Professor Sanborn, who took hold of an old worn-out, run down farm, made it to yield better returns, and will hand it down to succeeding generations far better than when it came to him. I say that ought to be the ambition of any young man on the farm who has the opportunity to succeed his father.

And now I want to close with some words which may not be appropriate, but it seems to me they ought to be appropriate to any business. The words are these:

"He who blesses is blessed
 And God and man shall own his worth
Who dares to leave as his bequest
 An added beauty to the earth."

FITTING ANIMALS FOR THE SALE AND THE SHOW RING.

(Prof. W. J. Kennedy, Iowa Agricultural College.)

I am glad to be here this afternoon to talk for a short time on this subject. I am billed to speak on the fitting of animals for the sale and for show purposes. This is such a wide subject that I feel if I were to attempt to discuss it I would be placing you in the position in which a friend of mine was placed. This friend entered a restaurant and ordered a cup of tea. He drank that, and ordered a second cup, and then a third. By this time the waitress was becoming somewhat anxious. When he ordered a fourth cup, she said, "My good friend, you must like tea." "You just bet your boots I do," he said, "or else I would not drink so much water to get a little of it."

Fitting Cattle for the Sale.—There is a decided distinction between fitting animals for sale and for show purposes, and that being true, I will divide my subject into two parts—first taking up the fitting of cattle for sale purposes. Now, there are three important things which we should keep in mind in fitting cattle for sale: The first and most important is to have the cattle in good condition—to have them well grown. The second factor to keep in mind is to have them well groomed—keep their horns well trimmed and their feet properly cared for. A third, and very important point, is to have them well broken.

Have the Cattle Well Grown.—Young animals intended to be sold by auction or private sale should be well grown. Every man who feeds young animals for sale and grows them well is well paid for his trouble and for the feed he uses. I think it is very important to have the young animal well grown. You can do that only by feeding the right kind of a ration, the kind Mr. Gose referred to this morning as a properly balanced ration. Professor Sanborn said it is necessary to have a rotation of crops, in order to keep the soil up. It is also necessary in feeding animals to have a properly balanced ration, in order to supply the good health necessary to show up the frame work. Beef cattle should be taught as early as possible to eat grain and hay and grass. Now, the grain part of the ration is most important. Feeders, as a rule, must take advantage of the roughage they have on hand, but for feeding young cattle there is nothing like alfalfa or clover. If you cannot get alfalfa, feed them clover. Another thing: Don't think you can feed your young cattle and grow them up successfully on corn alone. This is where a great many make mistakes. You must have a properly balanced ration. It must contain protein. Protein is essential in the growing and building up of the young animal. For this purpose *oats* is the best all-round grain we have. If oats are not too high they should be fed, as nothing equals them for feeding young animals or breeding cattle of any age. Now, corn being the chief product that we grow in this section, it is necessary that we utilize it, and a fair amount of it should be contained in the balanced ration. We feed a ration composed of corn, oats and bran, or oil meal, and we get very good results. Of course, bran is pretty high in price. In Iowa a good many are feeding alfalmo—corn, alfalmo and oats. There is no definite rule to follow. We must feed this and that and determine what is best. We must be governed by the needs of the animal; but, as a rule, we have found that a pound to a pound and a half of grain for every 100 pounds live weight, in addition to roughage, should give good results. So much for the feeding of the animal.

Have the Cattle Well Groomed.—We come now to the second important factor—getting the cattle well groomed and ready for the sale. They should have a good coat of hair. Oil meal is good to give a soft, glossy coat, and rubbing is a good thing. The horns should be kept trimmed up. A few hours spent in the trimming of the horns oftentimes adds many dollars to the value when the animal is shown. If the horns are blunt cut them down, scrape them and polish them up. Another and most important point is to have the feet in shape. A breeder looking for an animal wants one good on its feet and legs. Don't offer an animal for either private or auction sale with its hoofs grown out and turned up. It is a decided mistake.

Have the Cattle Properly Broken.—The third point is to have the animals properly broken, or halter broken. I don't know of any surer way to ruin a sale than to bring in the second or third animal and have it get away. If there is anything that will knock the average of the sale down, that will. It may knock off $30 or $40 for all the rest of your animals. It will pay better to spend $25 or $30 and get a man to teach those animals to lead and to stand than to have one of them get away and spoil the sale. If an animal gets away early in the sale, it will be sure to spoil the sale. I have seen men bring animals to the sale that could not be led, just simply had to be driven in. If such men lose a dollar they lose two thousand by not having their cattle properly broken. If you have a bad animal or a couple of bad ones, there is only one time to bring them in, and that is the last thing. Put the quiet ones in first, and then put the bad ones in later and they will not do as much harm.

Fitting Animals for Show Purposes.—Fitting animals for show purposes is different from fitting them for sale. The first thing you must have in fitting an animal for show purposes is the animal. If you have not got a good animal, you can not, by any method of feeding or management, make him a prize winner. You must have the right kind of animal. You had better look your animals over carefully before you spend much time in fitting them for show purposes. If you are not sure you have got a good animal, it is much better to throw it out early than after spending six months of the year in feeding it, because it will be thrown out somewhere. Of those things which go to make a good show animal, the first is *conformation.*

Another thing is breed type. I don't know of any place where the breed type is not important. It is very essential in any class of live stock. You must have that. Another point is *constitution.* You must have constitution for two reasons: It is first of all essential to give you fattening qualities. You cannot force an animal to do its best, unless it has a rugged constitution. Furthermore, in the breeding ranks, the judges are paying a great deal of attention to constitution, and we will have to pay more attention to it ourselves. Another thing is good feet and legs. We want size, but we want quality with it, and we want a good coat of hair and a good hide.

Feeding for Show Purposes.—Next comes the question of feeding. After you get the animal, the next thing is to feed it. Feeding varies with the different ages of the animals. Of course, with calves, they should have plenty of milk. They should have some roughage and a grain ration composed of some corn, largely oats and oil meal, or corn, barley and wheat bran. Some showmen even give milk to the yearlings, but that is not necessary. If an animal is off its coat, I don't know of any way you can improve the hide so rapidly as to allow the animal to suck the cow and get plenty of new milk. This will do it when everything else will fail. Ordinarily, we should aim to rear the yearling on something else. Feed alfalfa during the winter and grass during the summer months. For the grain part of the ration feed ground oats, some corn, ground barley, oil meal and wheat bran, but oats is especially good.

Of course corn or ground barley will force the animal along faster in the last month or two, but it is liable to get more flesh than quality. During the summer months you should use a great deal of grass. Nothing will cool off an animal like grass. During the winter months you should feed roots or silage. Silage will do very well, but will never replace roots. About the same kind of a ration should be fed during the winter as during the summer months.

I think the hardest animal to fit for show purposes is the steer. I think the hardest process any feeder has is to produce a grand champion steer. There is a time (some people say there is a day, an hour) when the steer is right; but I think you can get it right and hold it for a month or two in pretty good condition. A steer must have a certain quality of flesh—not too soft or too hard. There is a certain degree which we must have if we are going to make prize winners, and it is hard to get that. There are two or three very simple things which will help us: One is to cook wheat or barley—both will help firming; another is to feed bean meal or pea meal—either of these will firm an animal up better than wheat or barley. In feeding bean meal or pea meal, you should never use beans or peas until they are at least one year old. Don't use the new crop; they will not give as good results as one year old. In fitting a show steer, especially for the International, in December, it is very important that he be carried along nicely the previous winter. We aim to feed them largely on roughage clover hay, alfalfa, some corn, a great deal of oats, wheat bran, some oil meal (but not a great deal, as it tends to soften the flesh). A very important thing which we must keep in mind is to give them plenty of outdoor exercise—give them exercise every day. If you have a good grass lot on which there is a considerable amount of old grass, that will serve a very useful purpose in growing out the animal. When summer time comes on, we allow our cattle the run of the grass lot during the day in the early months when there are not so many flies and it is not so hot; and after the weather gets hot we keep them in the barn during the day and allow them the run of the grass lot at night. We aim to give them grass all the time. Grass will cool off the system and saccharize the food, and that is an important factor. During the summer months we do not feed very much corn, and very little oil meal, because grass will saccharize the food. We feed oats, some barley—not much grain. About the middle of August we commence getting the feeding going. We get the animals on good feed in September. September, October and November are the three months when we are finishing up and want to put on heavy gains. Sometimes it happens that cattle will go off feed, about October, and will not eat what you want them to eat and will not make the gains you want them to. When in Scotland, three years ago, James Bigger told me of a method he employed in getting steers to eat when a little delicate in appetite, which method we have used to good advantage. He recommended the feeding of one-half ounce of crude carbolic acid in bran mash. This freshens the appetite, starts them again to eating, and it is very important that you feed them well during the last few months, and keep up their feed to the very last. We want flesh all over the body, smoothly laid on, and neither soft nor hard, but mellow to the touch. The proper touch for the flesh is like that of India rubber; when you press the flesh it should give and then come back. Take an animal with flesh that you press, and the flesh does not come back, that flesh is too soft. On the other hand, we can get animals too hard. When that is the case, oil meal is a good thing; also, cooked oats and corn, or flax seed will help. But sometimes when an animal gets so hard, the only way to fix it is to *rub* it. It is surprising what you can do for a hard flesh in the last month or two weeks just by rubbing. I have seen animals brought out in this way when nothing else would help them. The steer on which we won the grand championship prize some two years ago in Chicago, we sent to Chicago a few weeks before the show and we rubbed him; and he was pronounced by the judge as the best flesh steer he had put his hand on for many years.

In addition to feeding, there are several other factors to keep in mind. One is the question of grooming. It is very important to have show cattle groomed well. You cannot do this in a week; it will not do to start a week before the show. You must start some months before and do a certain amount of it each day. Clean the hair out and go over the animal with a flannel cloth and give it a hand rubbing the last two or three weeks before the show. There is nothing much better than rubbing to get the right kind of coat on an animal. We believe in using the clippers on the head and on the tail. It helped us out in two hard places in Chicago. We won the grand championship, and we won the reserve grand championship by using the clippers. You had better keep the clippers off of the breeding animals, but they are especially good to be used on the fat animals. The late Mr. Bigger was the man who put me on to this. He always clipped them from the knees down and from the hocks down.

Now the question of horns: If the horns are long, they should be cut off. Don't cut too deep. Then scrape them and shape them. Don't allow them to grow up; it is no trouble to pull them down. After cutting and scraping them rub them with glass, then with coarse sand paper, and with chamois skin; then put on some sweet oil, and some whitening will help the appearance.

I believe that it also adds very materially to the appearance of the animal to have the hoofs well cleaned. I don't like to see a man lead an animal into the show ring with a lot of straw and manure on its feet.

Another very important point in showing cattle is to have them properly broken. It is a very exasperating thing to see an animal brought into the ring trying to get away. If you show an animal that is a kicker, and the judge gets a couple of kicks, he does not take kindly to that animal. I know what it is—have gotten them myself. I never liked them as well afterwards. Have them well broken before you show them. Teach them at home. You cannot teach them in a day. It takes weeks to teach them. Different animals require different treatments. One must be taught to raise its head, another to hold the head down. Teach them to stand, and when you get into the show ring, always stand on the same side of the animal on which the judge is standing; this will enable you to see the animal as the judge sees it. When the animal has some little fault don't try to hide it, because when you try to hide one fault, you often bring up others. Do your training at home; do anything that you can do in a legitimate way, so that in the ring you will have nothing to hide from the judge.

One more point: It is probably not just along the line I have been talking. I think that at all our county fairs and district fairs, and at our big shows, there should be prizes given for young men under 21 years of age, who bring out their animals in the best condition. There is nothing that will do so much for the boys, and keep them on the farm, as to give them prizes for showing their animals in the best condition. It will make them better breeders, and they will think more of the line of work they are following. I think that is something our county fairs could do to good advantage.

THE NEXT STEP IN AGRICULTURAL EDUCATION,

OR

THE PLACE OF AGRICULTURE IN OUR AMERICAN SYSTEM OF EDUCATION.

(E. Davenport, Dean of Illinois Agricultural College.)

The most significant fact in the educational world today is the demand that agriculture be taught in the public schools.

This is a radically new movement in education. Twenty-five years ago—fifteen years ago—it was unheard of. At that time, had the proposition been made it would have interested neither the farmer nor the educator; the one would have been indifferent, the other would have been horrified or amazed, according as the humor of it might have struck him. Today it is a live problem in which both the farmer and the educator are seriously interested, and it is one whose solution concerns them both.

Thinking men of all classes are now agreed that in some way and after some fashion agriculture must be taught in our public schools, both primary and secondary; meaning by agriculture not only the occupation of farming, but also the life of the farmer and the genius and spirit of country affairs; for agriculture is not only a profession, but it is a mode of life. It is, of course, unnecessary to emphasize the peculiar importance of teaching the fundamental principles and practices necessary to permanent systems of successful agriculture. Other great industries are commonly controlled from central offices, but every farmer must have knowledge to make him intelligent concerning methods essential to permanent agricultural prosperity.

Now, two radically different methods have been proposed for meeting this new educational demand in the secondary schools. The one method proposes a separate system of schools for country people, to be known as agricultural high schools, farm schools, etc., in which agriculture for boys and domestic science for girls should be the leading subjects taught, assuming that existing high schools in general shall be known and considered as "city schools," whose business it is to minister to the people of the cities and their concerns as the agricultural schools should minister to the affairs of the country. Several of these agricultural high schools have been already established, notably in Wisconsin and Georgia, and a bill which is now in Congress is designed to make the distinction not only clear but permanent, as between agricultural high schools that serve the people and interests of the country, and city high schools that serve the people and interests of the city.

The other method proposes not one system of secondary schools for the country and another for the city, but a single system for both. It proposes, for example, that the present system of high schools should not be denominated "city high schools" with a narrow range of interests, but that they should be so expanded in personnel and equipment, and so enriched in courses, as to minister to the natural interests of their environment, whatever they may be, agricultural, mechanical, commercial, literary, and what not; and that the present ungraded schools in the thinly populated country districts shall be condensed into larger and stronger units, meeting as they are able the educational needs of their communities, and evolving naturally and ultimately into true secondary schools.

The one proposal is logically for as many systems and types of schools as there are distinct interest and lines of instruction; the other is for a single system of education, with highly differentiated courses taught in the same schools. The one proposes to insert itself by main strength into the very heart of our system of secondary education; the other must of necessity develop by gradual process.

This demand has assumed, therefore, serious proportions so far as secondary schools are concerned, and in a very large sense we are at the parting of the ways in this matter. The demand for education in agriculture has come to stay. Indeed, it is but a part of a larger movement for industrial education; meaning by that, education with a view to some form of useful service in the fundamental industries as well as in the so-called learned professions. This demand has not only come to stay, but it has the sympathy and earnest support of the masses of the people and the very large majority of our best educators. The only substantial difference of opinion is as to the best method of procedure, whether by a series of schools, of as many distinct types as there are occupations and interests, or by a single system of schools with separate courses. Which shall be adopted as the final American policy of education is a matter before us for discussion—and there is at present no deeper educational problem—and more depends upon what we actually *do now* within the next five years, than it can depend on what we think and say and try to do twenty-five years from now.

This issue is upon philosophies of education so widely different that the choice once made will be final, and the consequences well-nigh irretrievable. I am one who firmly believes that within the next ten years we shall decide for all time whether we shall reap the full fruits of our thoroughly unique educational opportunities in America, or whether we shall needlessly follow in the footsteps of Europe, where social distinctions were established, and the peasant classes fully fixed, long before the modern age of universal education was thought of.

Personally I do not believe in that philosophy of education which would establish separate schools for the various industries and occupations of life. I greatly prefer that theory of social and industrial development which would establish and maintain a single system of schools wherein the people of all classes should be educated together, distinct courses being framed and conducted for the benefit of each in so far as the interests differ from those of the common mass or of other professions. My reasons for this preference are briefly as follows:

1. Separate schools can never be so good. This is axiomatic for both economic and pedagogic reasons. No school designed to minister to a single class of people and to a single line of interests can ever be so well equipped in the fundamental arts and sciences—in chemistry, biology, physics, history, literature, economics, and the so-called humanities generally—no such school can be so well equipped as can one designed to minister broadly to a variety of interests. Indeed, even if the attempt is made and a wide range of subjects taught, these same subjects will of necessity be studied and taught from a comparatively narrow standpoint. Every teacher knows and every investigator knows that in order to develop a subject well, either for purposes of instruction or of research, it is necessary to establish and maintain a favorable atmosphere for that particular field of mental activity, and this atmosphere is at its best only in the presence of students *interested mainly in that subject;* that is to say, there is no such favorable place in which the farmer may study chemistry as in company with others, not merely of his own kind but of those who believe that chemistry is the greatest thing on earth. There is no such place for the farmer to study history, and to learn to see himself as others see him, as where he studies history in company with those whose chief interest is not in agriculture or in engineering or in teaching, but rather in history itself, by which we study the true significance of world movements of all classes, and come to know things, past and present, in their

true perspective. That is to say, every man ought to be educated in an atmosphere not especially prepared for him and his own kind, but in an atmosphere and an environment much broader than his own interests. In this country, if our democratic institutions are to be preserved, and if our people are to labor together in peace and understanding, all classes must be educated in an atmosphere at least as liberal and as broad as *all* the interests of any single community can make it.

In saying this, I do not overlook the fact that the separate agricultural school has certain distinct advantages. They are the same advantages that are enjoyed by any other industrial school, or even a theological seminary, arising from the comparative simplicity of the educational contract they undertake. It is a fact, of course, that any school founded, manned, and equipped to do a single thing and minister to a single interest gains much in directness by its simplified problem, and by the direct methods it naturally employs. But it loses in breadth and relative values, as has been indicated and the best proof of it is that none of the separate schools yet founded offer as much even in science as the nearby high schools; and what they achieve is industrial training rather than industrial education—the training of the operative rather than the education of the citizen.

Sir James Bryce tells us that the chief purpose in studying history is to throw light upon our present action and future policies, because in a large sense history does repeat itself. In this connection it is well to remind ourselves that agricultural and mechanical education started in this country in separate colleges. This was necessary, because of the attitude of old line colleges of that day concerning industrial education. But that attitude has entirely changed, and today these two fundamental industries are strongest, both in instruction and research—not in the separate agricultural and mechanical colleges, but in our greatest universities, where all forms of education are imparted, and where American energy and American citizenship are trained in a cosmopolitan atmosphere. Not only is this true, but the proportion of agricultural students who return to the farm is greater from our universities than from our separate agricultural colleges, to say nothing of the masses of city boys directed countryward.

So I return to my first assertion, viz., that both from the nature of the case and from the experience of the past we may fairly conclude that separate schools are inferior schools; that they lose more in breadth than they gain in directness and can never rank in real service to that other type which ministers to many interests and gains directness by its distinctly separate courses.

2. Separate schools will tend strongly to peasantize the farmers. To undertake to train the children of farmers in a system of inferior schools, such as these must inevitably be, with little knowledge of and less regard for the affairs of other people—such an attempt, if it succeeds, will peasantize the farmers in America more rapidly and more certainly than they were peasantized by other causes in Europe generations ago.

To segregate any class of people from the common mass, and to educate it by itself and solely with reference to its own affairs, is to make it narrower and more bigoted generation by generation. It is to substitute training for education and to breed distrust and hatred in the body politic. Knowledge is necessary to a just appreciation of other people and the professions and mode of life; with this only can a man respect his own calling as he ought and love his neighbor as he should. We cannot segregate and make an educational cleavage at the line of occupations except to the common peril.

Reduced to its lowest terms, one of the present propositions is to transfer bodily the European peasant school to American country soil, the inevitable consequences of which are not difficult to foresee.

We may one day need the real trade school in agriculture—the form of instruction that aims at training rather than education; at information rather than development; at mediocrity and below rather than mediocrity and above. This time may come, but it is not here now, and our greatest present need in agriculture is to educate the land-owners rather than their hired operatives; to educate a class of people upon the land that are in every way the equal of their compatriots in the city or anywhere else.

The European peasant belongs to a class whose economic and social status was fixed generations ago by a variety of causes, mostly political; and when the problem of universal education came up for solution there the only way in which the benefits of education could be approximately enjoyed by all the people was to found a system of peasant schools which should secure results with a maximum of manual training and a minimum of mental education. How difficult of achievement was even this step, will be appreciated by any student of Irish industrial history, or by any one who has read Sir Horace Plunkett's "Ireland in the New Century."

When these times come to this country, if they ever do, I fervently hope that by that time our secondary schools will have become so well organized and so broadly equipped as to handle the trade school together with that higher form of industrial education which now engages our attention.

The American farmer is not a peasant. He has never yet been peasantized, and I fervently hope he never will be peasantized. He belongs mostly to the ancient and honorable Puritan stock descended from that great middle class of England that came to this country to establish and maintain not aristocratic, but democratic institutions. This is the stock that first felled trees, then built churches and school-houses, and prepared to govern themselves and to found a nation and a race whose institutions should rest on the intelligent activity of all the people.

This stock has never been exceeded, not only for hardihood and industry, but for its appreciation of the benefits of higher education and of the better things of life. This people held three things to be cardinal virtues—to labor, to go to church, and to go to school. This is the people that founded Harvard College in the wilderness. It is from stock of this sort that the typical American farmer is descended, and I would see him so trained and so educated as to remain true to his type for all time. This will require a training and an education that cannot be imparted by any form of European peasant school, however modified; but it will require the best that modern human ingenuity can devise. This great need will be met, when it is met if ever, not by old, but by new systems of education, and they must be wrought by ourselves to meet conditions here.

3. To educate the children of different classes separately is to prevent that natural flow of individuals from one profession into another which is in every way desirable, both from the public and the private standpoint. If the children of farmers are systematically put into schools where only agriculture is taught, many a good lawyer and many a good citizen will be spoiled to make an indifferent farmer. Boys do not necessarily inherit the father's profession. In a very large sense their natural faculties come from that common stock of human characters that constitute the heritage of the race and the individual has a right to an education that is broader than the occupation and the narrow environment in which he was born. True, he should be educated *through* and to a large extent

by means of his environment, because that is the compass of his own experience; but if we educate him *within* his environment, we dwarf him in the process, and we do not truly educate him.

Again, many a boy, city born, has the instinct to get back to Nature. He should have at least a fair chance to do so. Because a girl is born in the country is no sign in America that she should be a farmer's wife; nor if she is born in the city is it a sign that she should not. My plea is, in the name of common sense and American citizenship, educate all these people together in one school, with a curriculum varied enough to fit for more than one occupation and more than one mode of life, to the end that a man may follow the occupation of his father or may change it, as he pleases; but whether he follow or whether he change he shall do so intelligently, and for a reason, and in either case he shall have some knowledge of and sympathy for the occupation and the life of his neighbor.

It is said that if you give a bright boy a good education and broad associations, he will leave the farm, and the only way to keep him there is to train him to be *contented* with a humble life. That false theory of education was exploded long ago. Experience has abundantly shown that education does not necessarily result in taking people out of the country except when that education is one-sided and faulty, as witness the graduates from some of our greatest universities. I have no sympathy with the plan of keeping boys on the farm by the blindfolding process.

There was a time, now happily past, when the schools ignored not only agriculture but all industry. Then unthinking teachers advised bright boys and girls to "get an education so they would not have to work." This sort of doctrine found fertile soil in the young of hard-working, self-denying pioneers, and it was not strange that most young men who had much contact with the schools were lost not only to the farm but to industrial life. Then it was that men saw the best of the young crowding into professions already overcrowded, and they noted with sorrow and regret that education served principally to draw men away from the useful callings and to pile them up like salmon in the spawning season where they were not needed or wanted, and where little awaited but their own destruction.

The country is, and always will be, the great breeding-ground for the nation, and the consequence of this insane movement cityward of the choicest men and minds could have had but one final effect—to put the brains in the city and the brawn in the country. It was not strange that under conditions such as these thinking men first denied higher education to their young because of its inevitable consequences, and then came to demand a form of education that should really serve the needs of industrial people as well as those of professional people. In this way arose the separate industrial schools, but later experience has shown that one extreme is as bad as the other—that industrial training without education is but little better than education without industry, and that both will inevitably result in a most unfortunate sorting process; both alike will prevent that natural flow from one profession or mode of life to another, so essential to meet the natural desires of individuals, and to secure that homogeneousness of population with which only institutions such as ours are safe, or even possible.

Though it is true that educators did not lead in the movement for industrial education, it is true that they were quick to see its significance, and today it is our greatest educators and our best teachers who are the most earnest disciples of the doctrine that a system of universal education should fit for *all* the needful activities of a highly civilized race, to the neglect of none and to the prejudice of none.

And this is a perfectly stupendous problem. Think of its new complications! In the old days all that was necessary was to maintain whatever schools could win support and teach the things most easily taught without much regard to the consequences. Now in these days of universal education we must teach what the world needs to know for *all* its essential activities, and we must so conduct our schools as not to greatly disturb the economic or social balance of things; so conduct them that the overflow from one occupation or class shall be naturally compensated by a corresponding inflow of equally desirable individuals from others—all of which is necessary if universal education is to be an unmixed blessing.

4. Secondary schools devoted solely to agriculture would of necessity cover so much territory as to require the students to board and room away from home. This for students of the high school age is unthinkable. Every boy and every girl in the early and middle "teens" should sleep every night under the father's roof. and this can be if a community establishes a single school capable of catering to all its needs, and does not insist upon educating one class here and another there, compelling long journeys to get to the right school. A single agricultural school in ten counties, or in five counties, or in one county—think of it!

The problem of secondary education is very largely the problem of the fourteen-year-old, and we should never rest easy till every farmer's boy and girl may go to the *nearest* high school, and there find instruction not only in agriculture but in the other industries and professions which concern the community, and after having lived the day in an atmosphere broader than their own studies, go home again at night to dream of what a great thing the world is and to wake with an intelligent appreciation of the place in it which they propose to occupy.

5. Agriculture not only needs contact with other interests, but they need contact with agriculture. Every one who has had experience with the introduction of agriculture into our state universities will bear witness that the benefits of association are mutual.

In the university which I have the honor to serve, our agricultural students not only get a training and a breadth of vision which they could never get in an institution devoted solely to their own interests, but their presence on the campus is of distinct advantage to the other students. Their directness and their practical methods of work are wholesome to the institution, at least they are so declared by the non-agricultural professors and students alike. In every way, as I see it, much is lost and nothing gained by separating the students of different classes and educating them apart, each in the occupation of the father.

Nor would I put all the so-called industries in one class of schools and the professions in another. In a large sense all study is professional, and in a very large sense, indeed, it is also industrial. Some portion of the training of every individual should be industrial, even manual, and another portion of the training of every individual should be distinctly mental, until habits of thought are formed quite *independent of material activity.* For these reasons, which are fundamental, I would not separate industry from any of our schools. I would make it an integral part of every curriculum, its proportion and character depending upon the prospective profession of the individual; but above all I would have the essence of all occupations, or at least of as many as possible, represented in the same school.

My point is, if all these subjects and professional points of view are offered in the same school with more than one avenue into life, then the opportunity is presented for the individual to acquire professional knowledge and skill without becoming narrow as a man. If farmers and lawyers and editors and engineers and artists and merchants are educated separately, they will either hate or despise each other, or both; if they are educated together, each will acquire, besides proficiency in his own line, a sympathy for others that comes so easily with that partial knowledge and acquaintance through daily association in the school age, and that comes with so much difficulty in any other way. A farmer at our university is a little different man, because law and economics and engineering and Greek are well taught in neighboring buildings, even though he never take one of the courses laid down in the catalogue. The very fact that they are taught and that he associates with those who do take them—all this has its effect, and in a thousand ways a man absorbs something out of every activity that is going on about him. My point, again, is that this is the only adequate atmosphere in which to educate an American citizen, whatever his occupation is to be.

6. To establish separate schools for agriculture is to injure the development of existing high schools. These schools are not "city schools" in any proper sense of the term. The great bulk of them are located in small towns and villages in a distinctly rural environment. To denominate all these as "city schools," to be devoted solely to the interests of city people, is as absurd as it is unjust to them. These schools, like all others, have the natural right to minister to their constituency; but if now agriculture is to be put off into a separate system of schools just because the high schools have not yet taught the subject, then it will be easy, later on, to cleave off another industrial slice, and again another, until the remnant that remains will be suited to nobody's need, unworthy alike of the school and the community it was established to serve; and instead of an organized system of effective education we shall have an incongruous medley of separate and independent schools, each serving its little clientele in a narrow way without much regard to the public good—all of which is against the true spirit of universal education.

The American high school is a new institution. It has arisen from our determination to make education truly universal. Now, universal education means that all the people shall be educated, and in such a way that all the activities necessary to a highly civilized race may develop and go forward. Only a small per cent. of the people will ever go to college, and *the experiment of universal education will be tried out in the field of the secondary schools.*

These, more than the colleges, will prove to be the agencies by which the masses of the people will get their training and their trend. For this reason the future welfare of these schools is to be specially safeguarded; but every subject and interest that is taken away from the high school in the present stage of its development lessens by that much its power to serve the community, and by that much it is a menace to its life and efficiency and a check if not a bar to its further development.

7. Separate schools in agriculture will check the extension of high schools into country communities. High schools started first in the cities, it is true, but they are making their way rapidly out into the country, a tendency that is to be encouraged, more especially as they are showing a remarkable disposition to respond to their environment. If the interests are not divided, it is entirely possible for any community, without going beyond driving limits, to throw all its energies into a school of secondary grade and make is capable of truly reflecting all its varied interests. This has been found impossible where secondary education is primarily under ecclesiastical influence; it will also be found impossible if interests are to be divided and as many separate schools established as there are interests to be served, but if they will stay together and solve their problems as a unit, it is possible for every prosperous community to give its young people at their very doors what is to all intents and purposes a college education.

8. It is unnecessary to found separate schools in order that agriculture shall be taught, and well taught. I am enough of a partisan for agriculture to demand what is needed for its development: to advocate, if necessary, separate schools for this purpose, even if they should result in reducing the scope and curtailing forever the full and possible development of the high school. But it is unnecessary to resort to this expedient in these days. It was necessary to do so in an early day, because of the indifferent, not to say unfriendly attitude of the schools of the time, all of which were organized and conducted on the classical basis in order to fit for the so-called learned professions. Such schools had little knowledge of and less sympathy for industrial education, and to get a start at all it was inevitable that separate schools should be established to do what existing schools would not in those days undertake.

But conditions are changed. We are living now in a new age—in an age which recognizes that the highest purpose in education is to get ready to live; that real education is active, not passive; and that its fruitage is service, not personal gratification. We are living in an age which recognizes that all forms of useful activity can be made yet more useful by the knowledge and the graces of education; and that the man himself is bigger than his occupation—bigger than that narrow avenue of public service through which he obtains his livelihood, and discharges the ordinary debts to Nature. We have *all* learned this lesson, and by this time we ought to have learned it well. It is true, that education for industrial people, and after that education in and for industry, arose from the masses and was forced upon the schools. I do not forget all this, but I beg to call your attention to the fact that that early demand was a selfish one,—a righteous selfishness, it is true, but yet selfish. The masses wanted education for their own purposes, and it caused no little jolt to the educational juggernaut when they proceeded to get it. But when they had time to recover their breath, educators—real educators—began to take stock of the situation, and they have commenced in these days a new policy of education in the world; a policy which if followed out, will develop all our resources, both industrial and intellectual; a policy which will take care of your personal needs, and mine, and yet which is as broad as humanity and all its activities. This new policy is working successfully in our great state universities where men of all classes, aims, and prospects are educated together from the standpoint not of private interest but of the public good. The same policy has commenced its work in our secondary schools and I am anxious above all other considerations that these schools should solve this whole problem for their communities; besides, I know educators well enough to believe that they will earnestly undertake to do it if they are entrusted with the duty, which is also a privilege.

These modern schools must have a fair chance. They are new institutions; they have hardly been in the field a half century, and how they have grown! There are literally hundreds of them that are giving a better education than colleges gave a generation ago, and they have only commenced to serve the people. If they have not yet solved all the problems and taught all the subjects the people need, it is no sign that they cannot or that they will not, and they should be given the chance. Every new addition to an educational institution not only serves a new public need, but it enriches all that was before. All the modern secondary school needs in order to serve us perfectly is men and money, and time to learn how.

There is no longer an "issue" in education—certainly not concerning the fundamental industries. I am told that in certain remote sections of the country some people are still fighting the Civil War, but most of us know that it is over. The old issues are settled and dead and left behind. New ones have arisen to command our attention, and it is unworthy of ourselves to expend our energies on lines of effort long since rendered obsolete.

Yes, the old issues between the classics and the industries are dead, and the sooner they are forgotten the better. I have been through this educational conflict myself, and I know what it is; but even the old soldier who insists upon fighting the Civil War over again, today, will get no audience. New problems have arisen with the new generation, and this generation proposes to stand on whatever has been gained before and expend its energies in forward movements. We do well to imitate its example in this matter. The new issues are constructive.

9. This demand that agriculture be taught in the public schools is but part of the great modern movement for industrial education. Whoever has lived close to the great heart of the common people, and has his hand upon the pulse cannot fail to have felt the throbbings of this new impulse for more than a generation, or to have detected its first feeble flutterings an hundred years ago. And whether he has had his ear to the ground or not, whether he has lived close to the heart of things or away in the upper atmospheres, no man can now be ignorant of the great fact that a change is coming over the spirit of the times regarding educational ideals; a change that is fundamental, and whose shadow or whose light, whichever it may be, is full upon us and can no longer be averted or ignored.

When each community had but one or two educated men—the dominie, the doctor, and perhaps the lawyer, it did not greatly matter what their education might be like; but when everybody learned to read, and to think, which was inevitable, they quickly saw that the system and the subject matter of an education suited to the office and the study were ill-adapted to fit men for the farm and the shop, but exceedingly well adapted to unfit them. They, before the educators, learned that the benefits of education were capable of being extended to all the affairs of life, material as well as intellectual.

But, as has been repeatedly noted, educators soon caught the true spirit of the new demand and were quick to respond. They have responded so well as to discover that in the last analysis there is an intellectual basis to all industry and an industrial basis to all education that is safe for everybody to use; they have shown that the names of various occupations are but names for different forms of activity and service; that all fundamental occupations are learned professions, and that any form of education that fits for nothing in particular is worse than useless, even dangerous.

So we must look at this matter broadly. Our problem is but a part of a more general one; moreover, this general problem of how to educate for all the useful activities is the very problem upon which all educators are busily at work, and they are solving it inch by inch and day by day. It is for us to stay with the crowd and be in at the finish.

The American high school is a form of secondary education that has arisen, or, more properly speaking, is arising, to meet this new demand for universal education. Agriculture, and industrial education generally, have found their true place in the universities. The next step is that they should find their true place in our secondary schools, where, after all, our attempt at universal education will render its greatest service.

And so reasons might be multiplied indefinitely, showing why it is wiser to go forward meeting our educational necessities together—but they would all be of the same general tenor, viz., that our educational problem is after all a single problem—complex, puzzling, and all that; but it is a single problem after all, and we should stay together and solve it.

If the high schools were as indifferent and as antagonistic toward industrial education today as the colleges were fifty years ago, I would raise my voice loudest for a separate system of agricultural high schools. But they are not indifferent, they are interested, they are not antagonistic, they are exceedingly friendly. Agriculture has found its place in our American system of education so far as colleges are concerned, and its place is in most honorable company. It remains to find its place in the high schools, and when that place is found, may it be equally honorable and equally favorable with the place it occupies in our great universities where it has done so well.

And now, after having argued, even pleaded for the preservation of the integrity of our system of secondary education, there are two points on which I wish especially not to be misunderstood:

The first one is this: When I speak of teaching agriculture in our high schools, I mean *agriculture.* I do not mean Nature study, nor do I mean that some sort of pedagogical kink should be given to chemistry or botany or even geography and arithmetic. Let these arts and sciences be taught from their own standpoint, with as direct application to as many affairs of real life as possible; but let chemistry continue to be chemistry; let agriculture introduce new matter into the schools and with it a new point of view. Nor should this new matter be "elementary agriculture." In some ways I could wish the phrase had never been coined. What is wanted in our high schools is not elementary agriculture, but elemental, fundamental agriculture. For this purpose we should select out of what is taught in our colleges those phases of agriculture that are adapted to use in the high school and yet that strike at the root of farm life and its affairs—something that will appeal to real farmers, and that will serve to actually educate their boys for the business of farming—soil physics, soil fertility, laboratory fields in crop production, the use of farm machinery, and the classification and principles of feeding of live stock.

As I see it, every high school that has a natural agricultural constituency of any considerable importance should put in a department of agriculture on the same basis as its department of chemistry, and proceed to offer at least one year of real technical agriculture taught from the standpoint of the farm, accompanied by such collateral instruction in the arts and sciences as shall provide a suitable course for such of its pupils as find their interests in the country and on the farm.

The other point on which I would be particular is this: I am not arguing that the high schools in their present condition are doing, or are able to do, what is needed for agriculture. My contention is that they can get ready to do it, and that right speedily; and that if they will proceed to get ready, they should have the chance, for it is their opportunity and their privilege; and if they do not propose to serve agriculture and her people as faithfully and as well as they are serving or intend to serve other interests, then they should be compelled to do it. That is my thesis in a few words; but my conviction is that they are for the most part fully ready to turn both their brains and their tremendous efficiency loose on our problem if we will let them.

I am glad to say that we have a perfect understanding on this whole matter in Illinois. The schools are not yet ready to teach agriculture, but they will get ready. I would better say, they are ready but not equipped. We do not yet possess text-books and courses of study, but they are being prepared. We do not yet have competent teachers, but they are coming along, and the demand will bring the supply. The schools look directly to the colleges of agriculture to furnish, out of their experience, the most suitable material for these courses and to train the first supply of teachers. This they are fully able to do, and I am prone to believe that together we can work out this problem, and in the near future, if we are all wise and persistent we can provide as good a home education for the farmer as for other classes of our people.

And now if there should be high schools which prefer to go along in the good old way and not to trouble with the newer educational needs and demands, I have a word to say to them.

What our educational development is to be rests largely with existing schools. They can be quick to catch the spirit of a new order of things educational and enlarge both their conceptions and activities; or the new demands will be met by a new system, to the lasting disadvantage of both parties, as I see it.

We cannot afford to break in two at any point; least of all can existing schools afford to see our educational effort divided. The logic of the situation is all against it. The new ideal is that education should fit for something instead of fitting for nothing, and this ideal will prevail among a practical people like ourselves. Educators can take hold of this natural bent for practical activity and cultivate it until as a people we shall be both efficient and cultivated. If they do not do this the efficiency will develop by itself, and we shall all come short of our highest possibilities.

The new demand upon the schools is that they should not only picture life as it was in the past, but also as it is now; that they should assist the student in understanding modern life into which he must plunge, and whose responsibilities he must shortly assume. The student feels the right to demand that some portion of his educational career and some part of his school curriculum should be devoted to making *application* of the wisdom of the ancients and the philosophy of life to the conditions of modern existence.

Reduced to the lowest terms and pushed to the last analysis, that is all this new movement means in any of its forms—agricultural or other, viz., that the school hold up a true picture of life in all its activities, and that teaching be conducted from the standpoint of living, not merely of mental development; that the school shall be a true mirror of human life, modern as well as ancient, and of what men do as well as of what they think and say. In other words, that a system of universal education shall universally educate—not in art without industry; not in industry without art, but in both art and industry so joined as to make possible the highest civilization and the greatest development of which the human race is capable. To this end may agriculture, like every other form of useful activity, find its place in our existing system of education, and may that place be one that comports with the importance of the profession, the mode of living of its followers, and the philosophy of life on which our great social structure rests; for after all, the greatest thing in the world is to live a full and perfect life.

Sixty years ago Professor Turner wrote: "All civilized society is, necessarily, divided into two distinct co-operative, not antagonistic, classes—a small class, whose proper business it is to teach the true principles of religion, law, medicine, science, art, and literature; and a much larger class who are engaged in some form of labor, in agriculture, commerce, and the arts. For the sake of convenience, we will designate the former the Professional, and the latter the Industrial class; not implying that each may not be equally industrious; the one in their intellectual, the other in their industrial pursuits. Probably in no case would society ever need more than five men out of one hundred in the professional class, leaving ninety-five in every hundred in the industrial; and, so long as so many of our ordinary teachers and public men are taken from the industrial class, as there are at present, and probably will be for generations to come, we do not really need over one professional man for every hundred, leaving ninety-nine in the industrial class.

"The vast difference, in the practical means, of an appropriate liberal education, suited to their wants and their destiny, which these two classes enjoy, and ever have enjoyed the world over, must have arrested the attention of every thinking man. True, the same general abstract science exists in the world for both classes alike, but the means of bringing this abstract truth into effectual contact with the daily business and pursuits of the one class does exist, while in the other case it does not exist and never can till it is new created.

"The one class have schools, seminaries, colleges, universities, apparatus, professors, and multitudinous appliances for educating and training them for months and years, for the peculiar profession which is to be the business of their life; and they have already created, each class for its own use, as vast and voluminous literature, that would well nigh sink a whole navy of ships.

But where are the universities, the apparatus, the professors, and the literature, specifically adapted to any one of the industrial classes? Echo answers where? In other words, society has become, long since, wise enough to know that its teachers need to be educated, but it has not become wise enough to know that its workers need education just as much."

Professor Turner was pleading for an Industrial University to serve the educational needs of the 95 per cent. as those of the 5 per cent. were served by the then existing colleges.

His "dream" is realized, and more than realized. In every state there is now at least one institution of college grade ministering directly to these higher needs of industrial life. And what a change they have wrought in the few years of their activity! How the industries of life are developing under the benign and stimulating influence of higher education and systematic thought. How the people themselves are improving as their occupations develop and take honorable place among men!

All this has come about. But since Professor Turner wrote the words I have quoted, an entirely new system of schools has sprung up all over the country—a kind of schools unknown in his day, and which does not exist elsewhere than in America.

I refer ,of course, to the high school . Equipped as it is to give what is in effect a college education, this institution of the people is the most powerful modern agency for shaping American life. The high schools of the country touch all the people of all classes, and their influence is beyond computation.

And now, I ask the final question: Is this new system of schools to serve only Professor Turner's 5 per cent. as did the old time college, or are they to serve the full 100 per cent? Are the high schools to serve the people on the same broad plan of modern colleges, or are they to restrict their attention and their service to the few favored occupations?

These great schools can serve all classes and all interests if they will. It is merely a question of organization. Do I hear the objection that their courses are full—then I will say, make others. Do we have no material? The material lies all about us, in the present-day activities of men and in the great body of scientific truth that is rapidly accumulating. Are our teachers unprepared? Then let them prepare themselves; for as sure as time passes, this matter is upon us, and this question will press for its solution.

If the existing high schools cannot or will not serve the interests of agriculture and her people, then just as certain as the sun rises and sets, a system of schools will be founded that will do it. The farmers of this country are bent on good secondary education that will fit for country life, and if they are obliged to found a new system of schools to get it, then they will do that and insist upon a fair division of the revenues.

Let me be not misunderstood. It is not upon an endowed institution to teach agriculture, unless it chooses to do so; unless it sees in the subject large educative possibilities within the chosen line of its activities, and for which it is endowed.

It is different with the high school. This is a public school, supported by public funds, and its obligation is to serve the public well in all its interests—to put its service on the same plan as that of the state colleges and universities, and the temper of the public mind is such as to force the issue, if necessary. If it becomes necessary to found a separate system of schools to do this work it will be the worse for all of us and the better for none. If we go on together and our high schools serve agriculture and her people as faithfully and as well as they serve others, then all will be well.

This, then, is the place of agriculture in our scheme of education—that it shall become an integral part of our educational system, to the end that all great interests shall be served equally well by a single comprehensive system of schools; and the next step is to see to it that agriculture shall attain the same important and honorable place in our high schools that it has already attained in our universities.

RESOLUTIONS ADOPTED BY THE IMPROVED LIVE STOCK BREEDERS' ASSOCIATION, JANUARY 9, 1908.

Your committee begs leave to submit the following resolutions to the Allied Breeders' Associations here assembled:

1. That this Association commends the excellent work being done by the Department of Home Economics of the University, and earnestly recommends to the Board of Curators and to the Missouri Legislature the appropriation of sufficient funds for the construction and equipment of a suitable building for the Department of Home Economics.

2. That the Legislature make the necessary appropriation for the establishment of a school of agriculture at the University to which young men may be admitted directly from the country schools.

3. That this Association heartily commends the splendid achievements of the Department of Animal Husbandry in winning the highest place in the students' judging contest at the recent International Live Stock Show, and in winning so many valuable prizes with Missouri bred cattle in the fat stock classes in the leading shows of the past year. We recommend that the appropriation for this work be largely increased and every opportunity be afforded our University for continuing this good work.

4. We express our hearty appreciation to the Dean of the Agricultural College and the Board of Curators for their many courtesies, and especially for the excellent banquet enjoyed by this Association.

5. We also extend our thanks to the Missouri State Board of Agriculture and Secretary, Geo. B. Ellis, for the very successful programs and other valuable features of the Farmers' Week Conventions.

6. We urge his excellency, the Hon. Joseph Folk, and the Board of Curators, to begin immediately the construction of the agricultural building for which the last Legislature made the necessary appropriation.

F. B. MUMFORD,
(Signed) N. T. GENTRY,
GEO. KITCHEN, JR.

SESSION

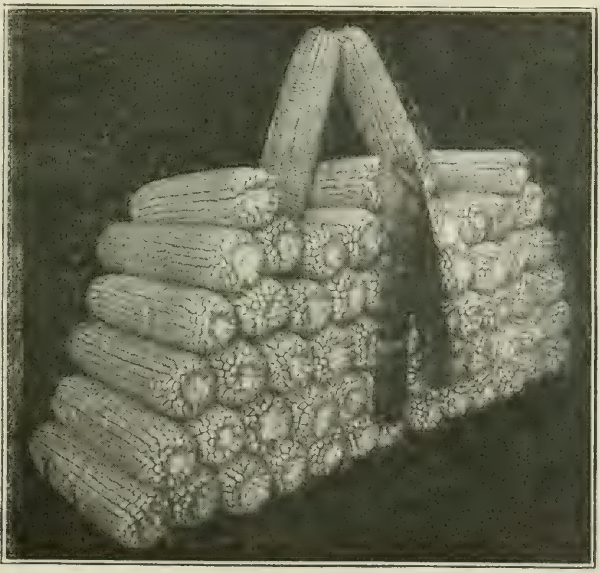
State Corn Growers' Association

January 8, 1908.

PRESIDENT'S ANNUAL ADDRESS.

(C. O. Raine, Canton, Mo.)

Corn is a word of Latin origin, and whatever the facts concerning its early history, it is certain that corn is one of the oldest of our agricultural crops. Mahiz was the name applied to corn in Hayti, when Columbus discovered that island in 1492.

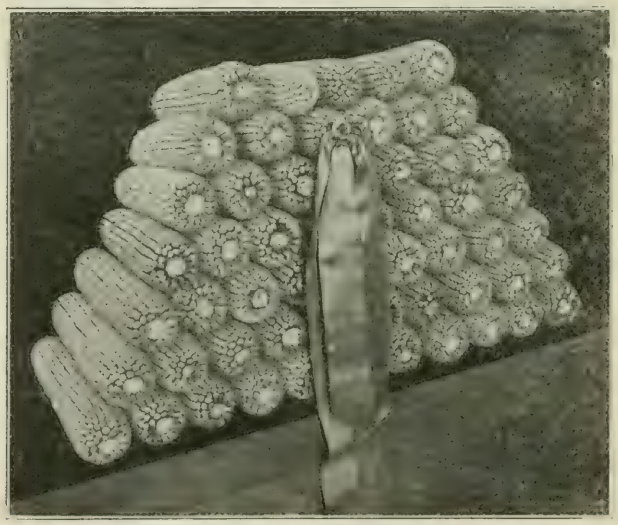


First prize bushel of white corn shown at the Missouri State Corn Show, Columbia, Mo., January 7-11, 1908.

He introduced it into Europe when he returned to his home. The early distribution of corn was coincident with the wanderings of the Indians, by whom it was cultivated according to the crude methods then in vogue.

The corn plant of today is far different from the plant of centuries ago in its general mechanism, and in none of our agricultural plants has there been a greater change than in the evolution of the corn plant.

Corn sustained the pilgrim fathers, and has been a staple article of food for man and beast since the discovery of this continent. Its relation to the prosperity of the nation has been strikingly illustrated. Poor crops is said to have been responsible in a large measure for the hard times of the early nineties. Mr. Coburn has styled it "The Barometer of Trade." It is a well known fact that a "bumper" corn crop stimulates agriculture in all its branches, and gives commerce in general a vitality and activity, which would otherwise be wanting. But it is as a food for stock that corn serves its chief purpose, although millions of bushels are used by the manufacturers, distillers and starch factories. Its use as human food is also increasing. Large exports of it in some form or another has also increased in recent years, and promises continued growth and we believe that low priced corn is a thing of the past.



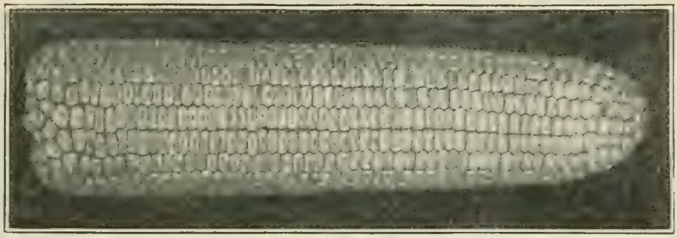
First prize bushel of yellow corn; also, sweepstakes bushel, at Missouri State Corn Show, 1908.

Its uses are too numerous and the territory in which it can be grown too limited to warrant prices current some years ago, when considerable quantities were burned as fuel in Kansas and Nebraska.

So large is the outlet for the crop that even if the yield were doubled, or even quadrupled, the consumption would undoubtedly be equal to the supply.

In urging an increase in yield, one cannot be accused of courting a calamity, for the country is hungry for "more corn and better corn."

The bulk of the world's supply is produced in America. Illinois, Iowa, Nebraska, Missouri, Kansas, Michigan, Wisconsin, Ohio, Indiana, Texas and South Dakota are the surplus corn states. Other states produce an abundance, but the states named produce the bulk of the output. It is grown in every state and territory in the Union, and the belt is expanding on all sides, and the progress already recorded in breeding it for earliness and other specific qualities indicate that in a few years the area in which it can be grown to advantage may be infinitely larger than the corn belt may appear to the casual observer of today.



A good ear of corn shown at the Missouri State Corn Show, held at Columbia, Mo., January 7-11, 1908.

As there has been so much written and said in regard to the breeding and feeding values of this product, and you are to hear from others on different phases of this very important subject, it is not my purpose to detract from their work by delving into the wisdom of maintaining the fertility of the soil, the anatomy of the plant, the types and relative values of each; but I might say that there was no such thing as scientific corn breeding until late in the last century when the subject began to attract attention in the central west through the work of James L. Reid and H. B. Terry of Illinois, James Piles of Indiana, and the Learnings of Ohio, and a few other growers who effected marked improvement in certain varieties by selecting superior seed for each year's planting. To evolve heavy yielding, corn is now the chief object of the more progressive seed corn growers, who, a few years ago, were intent upon producing typical ears that would score high or win prizes at corn shows. The commercial side is now uppermost with the corn growers. The work of our organization, due, largely, to the untiring efforts of our worthy Secretary and the Hon. Geo. B. Ellis, has been of untold value to the corn growers of our State. Improved seed is now being purchased by most all the progressive farmers, and no dealer or grower can afford to ship a customer inferior seed, and we would discourage the buying of shelled seed by our farmers, and now members of the Association, while we may not have attained the high standard, to which we had desired one year ago, let us not be discouraged, but let us take up the work of this session with renewed energy, realizing that we have improved the quality and increased the yield; yet are the people hungering for more corn and better corn.

IMPROVING THE CORN CROP BY SELECTION AND BREEDING.

(Prof. C. G. Williams, of the Ohio Agricultural Experiment Station.)

One seeking to improve his corn crop will quite naturally set about it in one of two ways: First, by improving the conditions under which the crop is grown—the environment; second, by taking advantage of the inherent superiority of one variety, strain or individual plant over another.

Environment may be classified as natural or artificial. Nature has been very generous with her store of fertility, her midsummer heat and rainfall in the so-called corn belt of the United States. The price of these corn belt lands would seem to indicate that some corn growers, at least were disposed to improve their corn yields by taking advantage of these bounties of nature. So far as the conditions of fertility are concerned we would not expect much variation from year to year, but in temperature and rainfall nature is not uniformly kind, as witness the average yield of corn in the seven corn states in 1901, as compared with 1902—an increase in yield in 1902 of almost exactly 100 per cent. Until some corn expert desires to appropriate this great interstate increase as a result of his teaching we will perhaps be at liberty to credit it to nature.

Environment is mighty in so far as the corn crop is concerned. It is not confined to nature either. Man steps forward, and by crop rotation, by fertilization and manuring, by the use of legumes, by the better care of seed corn and by better cultivation, increases his yields very materially.

Great is environment in the animal world. A few months of "home comforts" in the Mississippi valley will so transform the semi-wild razor-back hog of the forests of the south land that his own mother cannot recognize him!

A change of environment is as potent in the other direction. Turn your lordly challenger of the International over to the tender mercies of the average farmer, and he will deteriorate into something that looks very like the real scrub.

Great is environment! Sometimes it seems as though it was everything! But no. In a stable, with which I am familiar, are a half dozen cows. They belong to the same breed. Their ancestry is much the same—color almost identical. They have been fed the same kind of feed, differing by nothing in quality, and in amount by not so much as one-fourth of one cent's worth per day in the last 365 days. All working under the same controlled environment, and yet one has produced 400 pounds of butter the past year, while another has produced but 200 pounds.

To what is this difference attributable? Certainly to something inherent in the individual. This something existed, in part, before the appearance of this particular individual; it will be handed down, in part, to the descendants of this individual. This heritable something is what we know as heredity.

The individuality of each animal on this earth today stands out apart from all other animals and the wonderful improvement which we observe when we compare the record-breaking dairy cow of today with the cow of 100 years ago; the record-breaking American trotting horse of today with the trotter of the days of Dexter, has been brought about by selecting the exceptional individual from the mass and perpetuating his good qualities, in part, in his descendants.

The hereditary differences which have long been observed and taken advantage of in the animal world, exist also in the plant world. Assuming, then, that the proposition is accepted by you that ears of corn looking very much alike and nominally of the same variety, when grown under conditions as nearly identical as can be made, may vary widely in their productive ability, three very important questions present themselves, viz:

1. How can we best lay hands upon the superior individuals?
2. What methods are best adapted to the perpetuation of their superior qualities?

3. How much of the superiority, which we discover and attempt to perpetuate, can be transmitted to subsequent generations?

SELECTION OF SEED CORN.

Taking up my first question, I answer (1) by systematic selection of seed corn, preferably after a careful examination of the plant and ear in the light of its environment; (2) by the ear-row test.

In these days, when so much is being said about corn breeding, there may be a tendency to overlook what has been and what is being accomplished by careful selection. I suppose that J. S. Leaming and James L. Reid made no use of the ear-row test or of modern corn breeding methods, but they, nevertheless, secured some very valuable results. They certainly succeeded most remarkably in stamping their ideal upon their handiwork, and go where you may, you will find their varieties, and it is no very difficult matter to recognize them.

Not only did they succeed in establishing a certain type, but what is of more practical moment, they succeeded in establishing high yielding qualities. They may have spent a life time in securing their results, but the results were secured. While it is probable that modern methods will yield greater results, yet it is a little early to boast.

I am unable to state just what methods Leaming and Reid practiced, and consequently, under selection, I shall give you methods which we, of the Ohio Experiment Station, have found productive of results.

I think that all will agree that ears of corn are not always as valuable as their appearance would indicate. Excellence may be due to hereditary influence, or it may be due largely to external influences. As ordinarily selected from the shock, wagon or crib, a very large per cent. of seed ears are excellent, because they have grown under much more favorable surroundings than the average. Indeed, it is probable that if we could follow our choice crib selected seed ears back to the field where they grew we should find 80 to 90 per cent of them growing one plant per hill—their superiority clearly due to the fact that the plant had the food, sunlight and moisture of two or three plants poured into it.

It is exceedingly difficult to carry from one generation to another excellence which is the sole product of environment, unless the environment is carried along with it. Many corn growers are sadly disappointed in their purchase of seed corn for this reason. What they needed was not seed from the one hundred-bushel-to-the-acre field of some prominent seed grower, but rather the field itself and its environment. Seed corn excellence which rests mainly upon environment is not very valuable. What we want is excellence which is hereditary. By selecting seed corn upon the plant as it is ripening, one stands a much better chance to secure the latter.

PLANT SELECTION.

With this thought in view, the writer conducted tests in 1906 and 1907, in which ears selected from plants growing under normal conditions of stand, and as nearly normal in other environment as it was possible to judge, were compared with other ears of the same variety and selected from the same field, but selected from the wagon, no attention being given to environment. As might be expected, the ears selected from the wagon were superior in size and general appearance.

In 1906 eight tenth-acre plots were planted from the two selections, four plots of the plant selected seed, and four of the seed selected in the ordinary way. The average yield of the four plant
selection plots was.................... 72.49 bushels per acre.
Of the ordinary selection plots.......... 69.26 " " "
Gain for plant selection .... 3.23 " " "

In 1907 twenty tenth-acre plots were used in this work, ten being planted from the plant selected seed, and ten from the ordinary. The average yield of the ten plant selec-
tion plots was .... 89.04 bushels per acre.
Of the ten ordinary selection plots....... 84.64 " " "
Gain for plant selection .... 4.40 " " "

In connection with the matter of seed selection, permit me to call your attention to some characters in plant and ear which, I believe, deserve the consideration of the corn grower.

MATURITY.

I cannot speak for conditions in your State, Missouri, but many Ohio farmers are growing corn that is too late in maturing. In seasons like the present the loss from this source is quite serious. It is not wise to grow a variety which will only mature in seasons of extreme length. The habit of completing growth before killing frosts are to be expected should be well fixed. The variation in the time of maturing existing between individual plants of a given variety affords ample opportunity for the development of strains in which the character of early maturity is hereditary.

VIGOR.

Vigor, as evidenced by circumference of stalk below the ear, by freedom from disease, by leaf development and especially by ability to stand upright until harvest, is a character well worthy of consideration. It is not enough that a plant produce a good ear; it should be able to carry the ear to harvest. That this character is hereditary; that some mother plants can transmit it to their offspring, while others transmit the opposite, is, I believe, pretty well established. Last year in an ear-row breeding plot at the Ohio Station we had growing side by side, rows planted from individual ears, one of which had 56 and another 49 per cent. of its plants broken over before harvest. Between, and upon either side of these were other rows of which, in one instance, not a single plant, and in two others 3 and 6 per cent., respectively, were broken. The ability to stand upright did not result from having a lighter load to carry for the row of which 56 per cent. of the stalks broke over yielded 75.6 bushels per acre, while the row having every plant upright yielded at the rate of 114.7 bushels per acre.

In a recent number of the *Breeders Gazette* the Illinois Experiment Station reports similar results from an ear-row breeding plot of this season (1907), in which rows, side by side, show a variation of from 5 to 86 per cent. in the number of plants going down in a severe windstorm.

So far as my observation goes, the breaking over of corn plants presents a serious problem in very many corn fields. I believe that we can largely solve it by giving attention to the vigor and stiffness of the plants from which we select our seed. In other words, we must look to heredity for its solution.

POSITION OF EAR.

In the selection of mother plants the position of the ear on the stalk should be noted and extremes avoided. The proper height of ear will have to be determined by each grower for his own conditions, remembering that the continuous selection of the higher ears tends probably toward later maturity, as also the selection of extremely low ears tends to reduce the size of plant, shorten the growing season, and, of course, to decrease the yield.

The seed and market condition of corn is greatly favored if the tip of the ear points downward, thus shedding water.

WEIGHT OF EAR.

Weight of ear may mean much or little, depending upon whether environment or heredity are the controlling factors in its production. If stand of plants and conditions of fertility are uneven, and seed ears are selected without regard to such conditions, weight of ear is not especially significant. If, however, conditions are quite uniform, weight of ear is one of the best indications of productiveness one has. It should, of course, never be considered apart from maturity.

Referring to our own studies of the relation of weight of seed ear to yield, we find, upon dividing all of the seed ears which we have tested in our ear-row work up to this year into two classes, viz.: medium heavy and medium light, a gain in yield of 5.9 bushels per acre for the heavier ears, even though the difference of weight was on the average but 2.06 ounces per ear.

Our ear-row tests of this year (1907) were composed largely of ears of very different hereditary value, owing in part to pedigree breeding work. This factor would, of course, so disturb matters that comparisons regarding the bearing of weight upon yield would have no value.

It should be stated that all comparisons as to weight of ear are made only after seed corn is thoroughly air dry.

LENGTH OF EAR.

Of the two factors which certainly have much to do with weight of ear—length and circumference—our tests thus far have shown that length is of much greater significance than circumference. Ears a little above average length for a variety and locality have yielded more bushels of corn per acre than ears falling below average length, while ears of large circumference have proved lower yielders than those of medium circumference, showing that it is impossible to make up any shortage in weight due to length by increased circumference.

SHAPE OF KERNEL.

A correct shape of kernel, which is commonly described as broadening gradually from a not too pointed tip to crown, with edges comparatively straight, and of uniform thickness, is, of course, associated with good weight of ear and high yield per acre. I do not discover that extreme length of kernel is essential to highest yield. In dividing the ears of our several ear-row tests into two lots comprised of those having kernels above average length and a little below average we have found the yields of the two lots to be practically identical.

UNIFORMITY.

Uniformity, or a reasonable degree of trueness to the type determined upon, is quite essential to progress in corn improvement. It should include height and habit of growth of plants; height of ear, as well as size, shape, color and indentation of kernels.

This does not mean, however, that ideals are not subject to change, as facts are discovered which necessitate revision.

THINGS OF MINOR IMPORTANCE.

In studying the data we have collected regarding the ears used in our ear-row work for the last three years to see what light they will turn upon score-card points, we find that in so far as number of rows and number of kernels per seed ear is concerned, any variation within ordinary limits is not at all significant. Sixteen, eighteen and twenty-rowed ears appear to yield equally well.

Regarding the effect of per cent. of grain of seed ear upon yield, a medium to low per cent. (82.7 per cent.) has given a slightly higher yield of *shelled* corn per acre than the ears ranking highest (86.7 per cent. on the average).

Regarding indentation: Ears we have styled as medium—those having nice creases in crown of kernel—have yielded quite a little higher than the very rough dented ears.

There has been little difference in yield found as between cylindrical and moderately tapering ears, or between ears well filled and capped, and those having a little bare cob.

The protein content of seed ears has affected the yield but little. On the average the high protein ears have led slightly.

GERMINATION TEST.

I should probably say a few words regarding the relation of the germination test to the improvement of the corn crop. There is no one thing a corn grower can do that will mean as much in the way of increased yields as to test the vitality of each individual ear he proposes to use for seed. Our stands of corn plants are everywhere much poorer than they should be and poorer than they need be. The germination test, if properly conducted, will greatly improve them. I think that a quite common mistake is to conduct the test under very much more favorable conditions, especially as regards temperature, than obtain in the field, and as a result we get much better germination in the box than we get later in the field. We would get better results, if we conducted the test under more rigorous conditions.

There has been a tendency in the past, I fear, to expect most too much from the germination test. It will pick out ears which have been impaired by unfavorable treatment, but I doubt very much whether it will pick out ears of hereditary merit. We have not as yet tested this matter long enough to have much to say about it, but the indications are that the germination box reveals little, save the sort of care the seed corn has received.

As I pass from the consideration of selection as a means of securing ears of corn of hereditary value, let me say, gentlemen, that all the improvement in the heredity of corn of any particular moment which has been secured up to the present time has come from simple, though careful, selection. We have been "sizing" up corn much, as the dairymen in times past has sized up the dairy cow. We have both been looking for "signs." The invention of Dr. Babcock has done away with the necessity for depending solely upon signs on the part of the dairyman, and, thanks to Dr. Hopkins of Illinois, the corn grower now seems to have something more sure than signs to guide him in his search for superior corn plants, viz.:

THE EAR-ROW TEST.

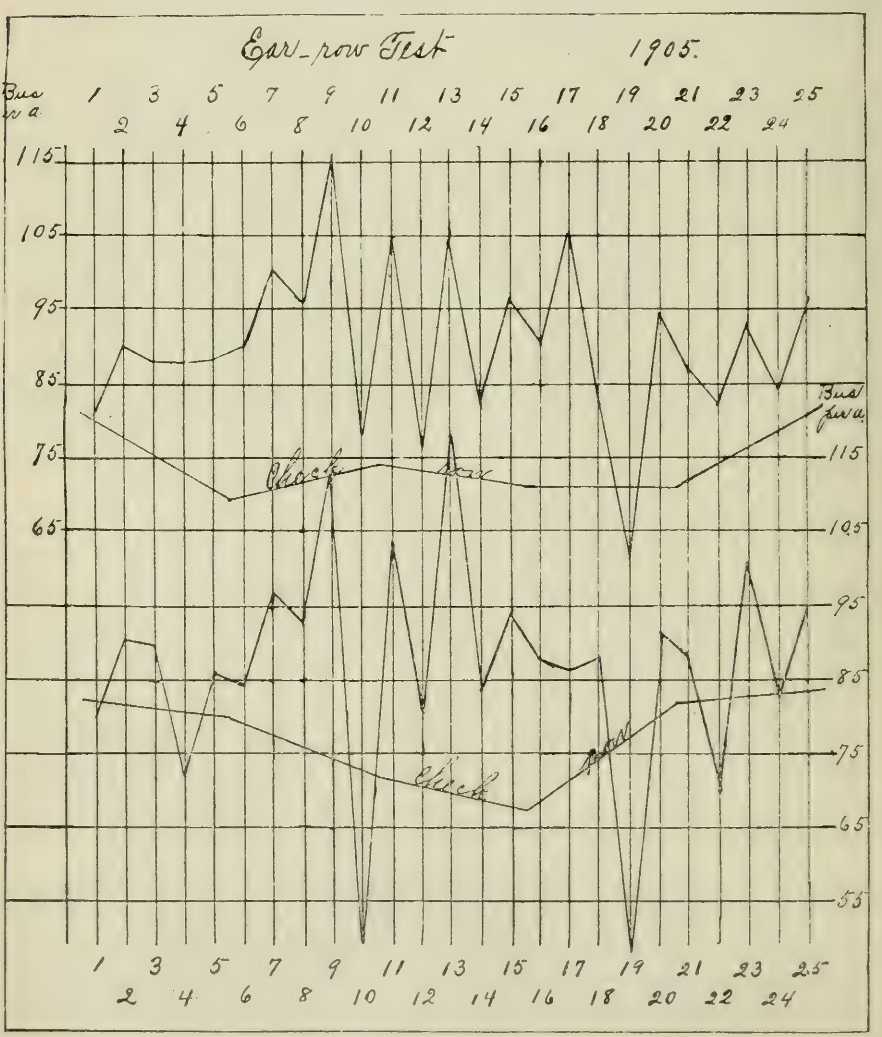
This test consists in comparing the productiveness of a number of ears of corn grown side by side, an ear, or part of an ear, being planted upon each row. I hardly expect I need take any more of your time in explaining what the ear-row test is. At a meeting of this character, doubtless, all present are familiar with it. Suffice it to say, it is the *relative standing* of the ears tested that is of moment. Actual yields depend upon environment, and go and come accordingly; comparative yields depend upon heredity.

DUPLICATION OF TEST.

I should possibly call your attention to what I believe to be a desirable way of conducting this test, viz.: the dividing of the seed available from each ear which is to be tested into two parts, and the planting of two widely separated, though shorter rows, rather than one long row, with the thought that the second, or duplicate row, will serve much more effectively as a check.

Here are curves showing the comparative yields of 25 ears of corn as tested in 1905. The variation in yield is indicated by the irregular line a-b for the one plot and c-d for the duplicates. Perhaps I should call your attention to the general correspondence between these two curves. You will note that with two important exceptions (ear 4 and 17) the ears behave, as compared with their neighbor, very much the same in the two plots. This can hardly help convincing one that heredity is more largely responsible for

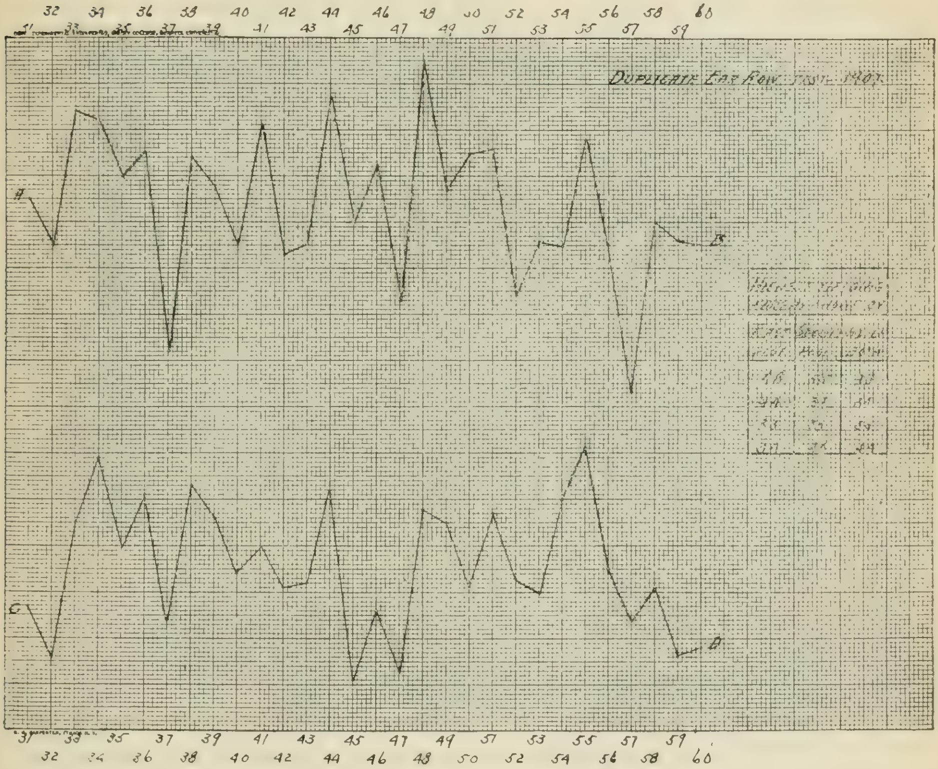
CHART I.



the wide variations which we see than is environment; and yet environment does enter, and hence the need for duplication.

Basing our selection upon the first plot, the highest yielding ears are 9, 17, 11 and 13. Based upon the yields of the same ears in the duplicate plot, 13, 9, 11 and 23 would be chosen. Ear 17, which stands second in yield in the first plot, is rejected by the second. Ear 23 which stands fourth in the second plot, occupies a much inferior position in the first.

CHART II.



In Chart II we have shown the comparative yields of 30 ears, as tested the past season. If we let plot one pick out the four winners, we would lose ear 55, the highest yielding ear in plot two. If we let plot two decide the matter, we would lose ear 48, the highest yielding ear of plot one. By taking the average yields of both rows, we probably get the four best ears, namely, 48, 34, 55 and 44.

In order to show the value of the duplication of the work, permit me to call your attention to two charts showing the comparative yields of ears in two sets of rows. (See Chart I.)

Earlier in my paper I assumed that the proposition that ears of corn vary widely in their productive ability was accepted. The data which I have just given you for another purpose will serve to verify this assumption, and also the utility of the ear-row test in finding them.

Having found ears of corn, which we have reason to believe have hereditary merit, I come to my second question, viz.:

WHAT METHODS ARE BEST ADAPTED TO THE PERPETUATION OF THEIR SUPERIOR QUALITIES?

Two methods of procedure are suggested:

(1) The selection of seed ears directly from .the highest yielding rows in the ear-row test. In this way we shall know with certainty that one parent—the dam—is a superior individual, and if one-half of each row be detasseled and seed saved from the detasseled end we shall know that it is cross bred, which has been proven to be quite essential; but with what ear it is crossed, as sire, we shall not know. If nearby rows are from equally high yielding ears, the cross will very likely be satisfactory. But if, as frequently happens, these nearby rows are much inferior to the dam, it would seem that the cross might be improved. In any event, we know only one parent, either by number of performance record. The progency of such breeding, I think, might properly be described as half blood.

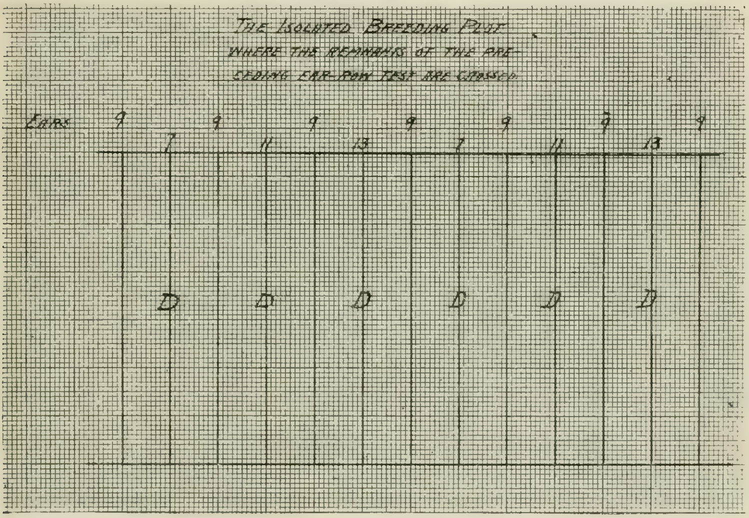
(2) The reserving of a portion of each ear which is planted in the ear-row test and when the harvest has shown which the high-yielding ears are, using the remnants of these high-yielding ears as the basis for future improvement.

These ear remnants may be used in several ways. Some have suggested isolating a single ear, thus building a strain or variety upon the best ear of a given test. We have some evidence along this line, which I will give you from the chart in a moment (see inbred ears, Chart IV), which does not look very favorable for the first generation, at any rate. In-breeding of this sort, while likely not as disastrous as self-fertilization, seems to be decidedly ill-advised.

A much better way is to cross these tested ears in an isolated breeding plot using one ear as sire and one or more as dams. The four or five best ears of an ear-row test plot may be handled very satisfactorily in a small breeding plot (see Chart III), using one ear (perhaps the best) as sire, planting it upon every other row. Two to four different ears may be used as dams, an ear to a row, detasseling, of course, every row, except the sire rows. In this way three or four distinct crosses may be secured; crosses in which both parents are known, and their performance records as well.

As this system continues, the performance records, not only of sire and dam, but of grandsire and grand-dam—and on indefinitely, are a matter of record.

CHART III.


THE ISOLATED BREEDING PLOT
WHERE THE REMNANTS OF THE PRE-CEDING EAR-ROW TEST ARE CROSSED
EARS
9
7
9
11
9
13
9
7
9
11
9
13
9
D
D
D
D
D
D

THEORY AND PRACTICE.

I come now to my third question—

How much of the superiority, which we discover by means of the ear-row test and attempt to perpetuate, can we hope to transmit to subsequent generations?

In answer to this question, I want to call your attention to the average yields of a duplicate ear-row test of 30 ears, conducted the past season at the Ohio Station (Chart IV).

Of these 30 ears 18 were new selections from the field, and consequently of unknown pedigree, and without performance records; 9 were pedigreed crosses from the breeding plot of the year previous, sire and dam, and the performance records of both known, while 3 were inbred pedigreed ears selected from the sire rows.

The 9 pedigreed crosses are Nos. 33, 34, 38, 41, 42, 48, 51, 55 and 56. With two exceptions you will note that they stand well toward the top. You will also note that the inbred ears stand well toward the bottom.

The average yield of the 9 pedigreed crosses is 78.01 bushels per acre. Of the 18 field selections, 71.01 bushels per acre—a gain of 7 bushels per acre for breeding.

It may not be amiss to say that the field selections were much superior to the pedigreed ears in so far as looks were concerned. The former were the pick of many bushels, while the latter of very few.

I must call your attention to ear No. 44, a new plant selection from the field, which has proved itself worthy to go into the breeding plot of next year. I have assumed in the past that such ears ought to be found each year. I believe they will continue to be found. It seems to me that the breeder who assumes that he gets hold of all the good ears he has need for in his first selection of 25 to 100 ears, thereafter depending upon "fluctuating variation," so called, for his improvement, is making a mistake. Nature does not stop working, but is continually offering us her new mutations. It would seem to be the part of wisdom to take advantage of them.

Prof. Dean of Ontario said, in an address before the National Dairy Show at Chicago, recently, "As a matter of fact, what successful breeders do is to keep a sharp lookout for the novelties which Nature may send them." If this be true, as he says, in dairy breeding, how much more true in plant breeding, where the numbers of individuals worked with are so many times greater.

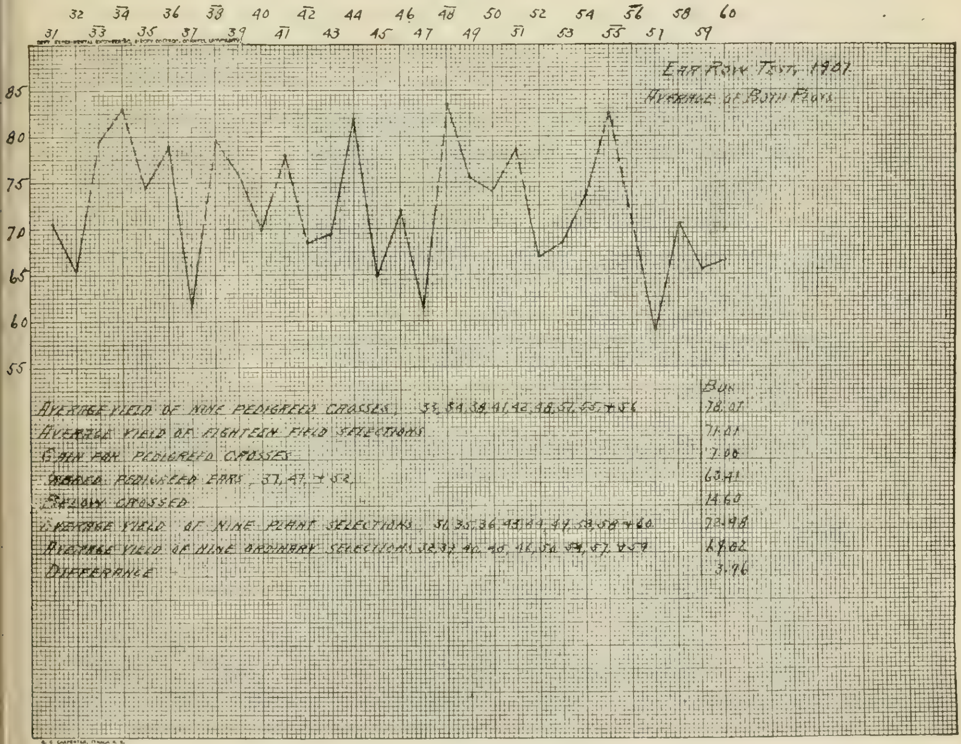
If for a single season we fail to find what we are looking for we need not despair. They are in our fields, and sooner or later will get into the ear-row test, and thence into the breeding plot.

BREEDING PROBLEMS.

Are we to expect that all crosses of choice pedigreed ears, and all the progeny of a given cross will be equally good? No! Referring to Chart IV, ears 34, 42 and 55 have the same sire and dam, but they are not all superior ears. Nos. 34 and 55 are "worthy sons of worthy sires;" No. 42 is not, and probably for good reasons, for while the sire and dam are the same, the grandsire and dam, and the great-grandsire and dam are not.

It looks as though we had about the same problems confronting us in corn breeding as in animal breeding, and that, like the latter, we shall find that it is not only a matter of breeding, but also of *weeding.* As the dairy breeder mates sire and dam of the best dairy breeding, he finds that he misses it, shall I say about as often as he hits it? At any rate, he finds abundant use for the scales and Babcock test in separating the good individuals from the poor. Doubtless, we may expect about the same results in corn breeding. In the ear-row test we certainly have an effective method of gathering the cream. Since the cream of one ear-row test becomes, in part, the seed for the next, and this in turn is skimmed for another, it would seem that the prospects for continued improvement were good.

CHART IV.



PLAN FOR CONTINUOUS CORN BREEDING WORK.

In conclusion, perhaps, I should outline a plan for continuous corn breeding work. In doing so, let me call your attention to Chart V. In starting the work, the first thing will be the selecting of the ears for use in the ear-row test. These should be selected the same as any seed corn, preferably upon the plant. I would, however, make this difference—I would give less attention to uniformity. Forget, for the moment, what the perfect ear of corn is like (if you can forget something you do not know!), and include ears of varying types. The second year these ears will go into the ear-row test, and the 3 or 4 that prove to be the highest yielding will, the third year be crossed in the breeding plot. Some of the pedigreed ears grown in the breeding plot will be merged (thrown together), and go into the multiplying plot of the fourth year, and the general crop of the fifth year. Others of those will go into the ear-row test of the fourth year, there to meet new selections from the field. The further work is simply a repetition of what I have given you. Each year has its ear-row test and its breeding plot. It is only the latter that requires isolation, for ordinarily we would not recommend the saving of seed from the ear-row plot.

No detasseling is done in the ear-row test plot, for the reason that it is a poor place to undertake to do cross breeding, even if one knew what ears, or rows, he wanted to cross, which, of course, he does not know until it is too late to accomplish it. The small breeding plot would seem to be the place to make crosses, and for manifest reasons.

CRITICISMS.

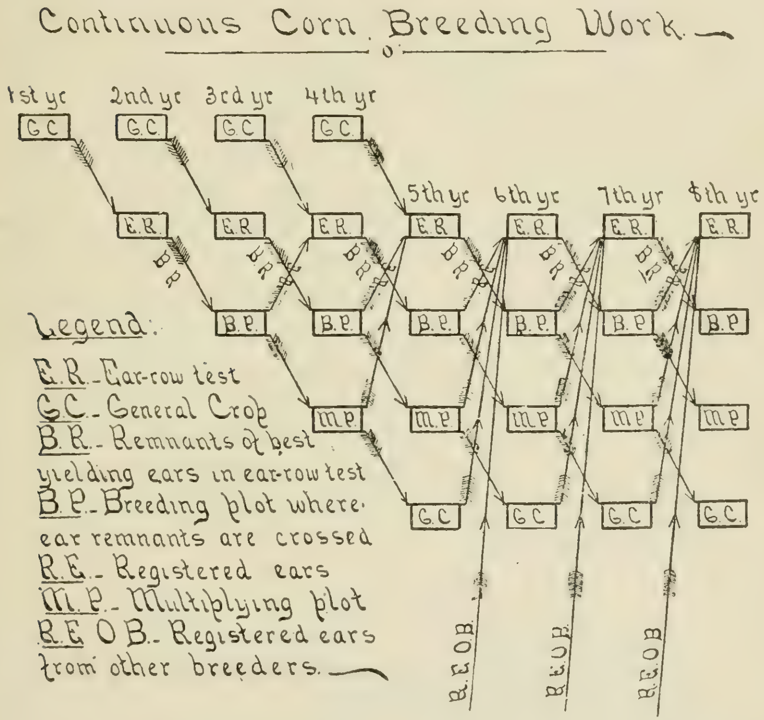
So far as I am aware, up to the present time, the one great caution which has been sounded in corn breeding has been the matter of inbreeding. The above system would seem to provide pretty thoroughly against it. If one has doubts in regard to this, it will be comparatively easy to introduce new blood into the ear-row test from other breeders of similar strains of corn which, as found worthy, would go into the breeding plots.

A recent criticism of this system of breeding (from the Connecticut Station) comes, however, from the opposite direction. It is questioned whether we may not be introducing so many new types from the field, and so frequently, that we shall never succeed in "isolating the best type."

Just what effect the introduction of the various types which have answered the requirements as regards vigor, maturity and yield set by the ear-row test, will have, it will be difficult to say. In the case of a self-fertilized plant like wheat, continually enforced crossing of this sort would likely be ruinous. However, with corn, which has been subject to *unrestricted* crossing for centuries, it does not seem that there would be much to fear from the introduction of a *limited* number of types which had so much in common. It is not clear that it would be desirable to isolate the best type to any further extent than would be possible in the use of the highest yielding ears of the ear-row tests. More than this, would very likely tend toward inbreeding. Furthermore, is any one ready, or likely to be ready, very soon to recognize the *best type?*

It is also suggested by the Connecticut Station that it would be better to do all the ear-row testing of field selected ears at one time, testing some 300 or 500 ears the first year, and basing all future work upon the 4 or 5 best ears found.

CHART V.


Continuous Corn Breeding Work.
1st yr
2nd yr
3rd yr
4th yr
5th yr
6th yr
7th yr
8th yr
G.C.
E.R.
B.R.
B.P.
M.P.
R.E.O.B.
Legend:
E.R.-Ear-row test
G.C.-General Crop
B.R.-Remnants of best yielding ears in ear-row test
B.P.-Breeding plot where ear remnants are crossed
R.E.-Registered ears
M.P.-Multiplying plot
R.E.O.B.-Registered ears from other breeders.

Ohio Exp Station.

So far as the number of ears to be tested is concerned, the more the better, if the larger number can be handled with equal care. However, a test in which the conditions are not uniform is of very little value. But granting that 500 ears are handled as carefully as 50 or 100, the question arises, would it be better to test these 500 field selections of one season's growth, or would it be better to extend this work over, say, five seasons? Our seasons differ mightily! The four ears that would win out such a season as this, would undoubtedly have come a long way from winning out last season, or, perhaps, next. If one is endeavoring to build up a best strain, or variety, for *average season,* it would seem that many different seasons should pick out the winners whose blood is to be fused into a composite strain adapted to average conditions. And this, I take it, is one of the strongest points in the system of breeding I have outlined to you.

Corn growers of Missouri! The problem of corn improvement is a vast one. We have hardly entered upon its solution. Of our other farm crops the same may be said. With the average yield of corn in the United States around 24 bushels per acre, and wheat at 13.5, it would seem that there is plenty of room for improvement. Much can be done to increase these yields by better fertilization and better culture. "Comparisons are odious," and I shall make none, but simply say that great possibilities for improvement are opening up before us as a result of breeding. There are Dan Patchens and Brown Bessies and Roosevelts in every corn field. I believe that we have, in the ear-row test, a means of finding them, and in the system of breeding hastily outlined a method of perpetuating them in a portion, at least, of their excellence.

With the hundreds of bright men at work along all plant breeding lines, at all our experiment stations—and no station is more alert, or has these matters better in hand than your own—with the host of wide-awake farmers of the corn belt attacking these problems with a keenness that is putting the station men on their mettle we have reason to expect that things are going to happen during the next ten years. I await the outcome of this general attack with intense interest.

DISCUSSION.

Mr. Crabtree—I think we cannot afford to forget the important things brought out by the speaker.

He discussed this question: How do we get that for which we are searching? How do we proceed after we have found that? And what do we accomplish in the line of experiment that has been carried out for the purpose of proving those things? The influence of heredity was a strong point. That will apply to plant and animal life as well, and will apply with great force to the growing of the corn plant. The speaker suggested that we try to find what we are searching for through the seed plot method of breeding and by turning our attention to what we find as proven by the seed plot. Let me say this: What the Babcock test has done for the dairyman in searching out the individuality of the cow, what the trap nest has done for the poultryman (the trap nest has brought up the type of hen to one that will produce 235 eggs per year, whereas a few years ago she would not produce more than 75 eggs per year), the seed plot has done for the corn breeder.

He called our attention to the necessity of getting something that would mature in the length of the season. The whole process all the way through is the principle of the "survival of the fittest," throwing out those that we find will not mature, and saving and breeding those that will mature.

THE IMPORTANCE OF CORN BREEDING.

(Ernest L. Hughes, Glasgow, Mo.)

More has been accomplished in corn breeding during the last decade than had been done before in the four centuries since the plant has been known to the white man. From the irregular, distorted nubbin of the Indian it as been improved by skillful selection and breeding until we have the finely shaped, high-yielding varieties of today. Yet, how far we are from perfection! How much room there is for improvement even in the best! Who ever saw a perfect ear of corn? There may be ears with perfect tips. There are ears with perfectly rounded butts. Others may be ideal in shape. Some have grains that can not be improved. But there has never been produced an ear absolutely perfect in every respect. There probably never will be. Here, then, is a vast opportunity for those who are striving towards the ideal.

There is not a variety of corn in existence that can not be made to yield more grain and of better quality by the right kind of selection and breeding. To the average farmer this, no doubt, seems a slow and tedious process. But quite the contrary is true. In a single year marked improvement can be made in the poorest, run down corn by an intelligent selection of seed. And besides this result of increased production, corn breeding is a most interesting work to those who will engage in it. To those who understand and appreciate it, plant breeding of any kind carries with it a pleasure—a fascination—scarcely equaled in any other avocation. It is a pleasure, indeed, to watch with anticipation the gradual development towards one's ideal of a perfect plant. There are disappointments as in everything else. But these should only stimulate to a keener insight into the working of nature. It is not a wonder that more young men of means, upon whose hands time seems to hang heavily, do not engage in the work of plant breeding for pleasure if not for profit? And there *is* profit in it.

There is no monopoly in corn breeding. Nature is impartial in the distribution of her help. Simply suggest to her your ideal and she will at once begin to get it for you.

In corn breeding great care is essential in the selection and fixing of the desired types. For by cross fertilization, many bad traits are brought out as well as good. And if these bad traits are encouraged by improper selection they will develop very rapidly and the variety will degenerate. This is why some farmers persist in changing their seed every two or three seasons. They say their corn will "run out" when raised on the same farm more than two years. Not long ago a prominent retired farmer, who was considered a model farmer in his day, told me that it is useless to try to raise the same corn more than two years in succession on the same farm. He sent to Indiana or Illinois every two years to get fresh seed, while if he had used proper judgment and care in selection his own corn would have become better and better from year to year. Think of the time and labor spent unnecessarily during the many years he raised corn. Since it takes about three seasons for corn brought from a distance to become acclimated, it is worse than folly to send to a distant state for seed for one's entire crop. If it is desired to try a new variety or strain from a distance it is best to begin with a small amount, and this should be purchased from the grower rather than the large dealer in general seeds.

The need of better selection among the farmers in general is quite apparent at local corn shows. There are usually, perhaps, from a half dozen to a dozen samples which show care in breeding, while the rest is simply corn. As one man expressed it "good enough to fatten a hog, good enough for me."

In speaking of the wonderful possibilities of plant breeding, Luther Burbank, the great plant breeder says: "It would not be difficult for one man to breed rye, wheat, barley, oats or rice which would produce one grain more to each head, or a corn which would produce an extra kernel to each ear, another potato to each plant or an apple, plum, orange or nut to each tree.

"What would be the result? In five staples only in the United

States alone, the inexhausible forces of nature would produce annually, without effort and without cost, 5,200,000 extra bushels of corn, 15,000,000 extra bushels of wheat, 20,000,000 extra bushels of oats, 1,500,000 extra bushels of barley, 21,000,000 extra bushels of potatoes."

The average yield of corn per acre for the United States is about 30 bushels. This will not pay for the labor of producing and the rent of the land. There awaits the corn breeder, who will produce a strain of corn that will add 10 bushels, even, to this average yield, a fame far greater and more lasting than that of the admiral who can safely lead a fleet of sixteen battle ships around the Horn. He will become a benefactor of the human race far more beneficient than the trust magnate who spends his declining days in trying to give away his fortune. He may not become as rich as Rockefeller, nor as far-famed as Roosevelt, but he will spend *his* declining days in the satisfaction of knowing that his life has been spent for the benefit of all mankind.

SOME EXPERIMENTS ON MISSOURI SOILS.

(M. F. Miller, Missouri Agricultural College.)

The wave of national prosperity which has been sweeping over the country during the past decade has exerted a most important influence upon the American farmer. Few classes of people have reaped such rich reward from these extraordinary commercial conditions as the men on the farm. Crops have generally been good (a fact to which a large share of the country's prosperity has been due), prices have been high and most farmers of the corn belt have made money. The farmer has seen his land rise in value from $30.00 to $60.00, or from $50.00 to $100.00 an acre during this time, while his tax rate has remained almost unchanged. He has sold his stock and grain at prices unknown since the close of the Civil War, and as a result his bank account has increased, and he has been able to add greatly to his farm improvements. But with the coming of a money stringency, with a less valuation on his products, he is now confronted with this problem: How am I to pay 5 per cent or 6 per cent on the present valuation of my farm, with a lessened valuation of products, with the productive capacity of my soil gradually decreasing and the possibility of a series of years of less abundant harvest before me?

A satisfactory solution of this problem for most men at least will be found only in a different system of farming, although just what this system shall be no one but the farmer himself can determine. One thing is certain, the young man who goes on a quarter section today with the idea of paying for it, must put more thought into his business and must give greater attention to improved methods of handling his soil and crops than his father did before him.

The Experiment Station has long felt that condition like these would come and that ultimately its work must reach out to other soils and other regions than those common to the location at Columbia, in order to give the farmer all the help possible in meeting these new conditions. It has recognized the fact that if the farmers are to receive the greatest benefit from its soil investigations they must be made to cover not simply a single soil or region but ultimately every soil and section of the State. Just how this work could best be carried out with the funds and help available has been the problem.

A beginning was made in 1905 when the Legislature of that year appropriated a small sum of money for what was termed a "soil survey" of the State, the avowed object being not only to outline in a more or less definite manner the important soil types as they exist, but to carry forward such investigations on each of these types as would be of most benefit to the farmers concerned. As a result, four soil experimental fields were laid out that season, two in North Missouri and two in South Missouri, the plan in each case being to determine not only the most immediately remunerative system of fertilization and cropping, but also the system which promised most as a permanent practice. During the seasons of 1906 and 1907 the number of these experimental fields has been gradually increased until 17 are now in operation. It is some of the results of these experiments that I wish to lay before you.

THE COMPOSITION OF PROMINENT MISSOURI SOILS.

There are seven mineral elements which plants require for their growth, and which must be obtained from the soil. These are nitrogen, phosphorus, potassium, calcium, magnesium, iron and sulphur. Fortunately for the farmer, however, only the first three of these, nitrogen, phosphorus and potassium are commonly lacking in our soils. The others, with the occasional exceptance of calcium (lime) are found in abundant quantities in all soils. Consequently it is to these three only that we need give special attention in a discussion of soil fertility.

The accompanying table shows the actual amounts of these three elements found in the surface seven inches of an acre in several prominent Missouri soils as compared with a very fertile soil as a standard.

	Nitrogen, lbs.	Phosphorus, lbs.	Potassium, lbs.
A very fertile soil contains	5,800	2,000	5,300
Unionville	4,140	785	6,706
Adrian	2,840	698	5,080
Monroe City	3,020	628	5,578
Victoria	1,460	453	4,583
Lamar	2,480	445	3,835
Billings	2,020	427	4,814
Dixon	1,680	400	3,569
Salem	1,140	290	2,590
Truesdale (White Oak)	1,240	440	5,660
Maryville (Rolling Prairie)	5,440	1,230	10,700
Malta Bend (River Bottom)	3,140	1,590	12,530
Maryville (Gumbo Bottom)	4,660	1,600	9,540

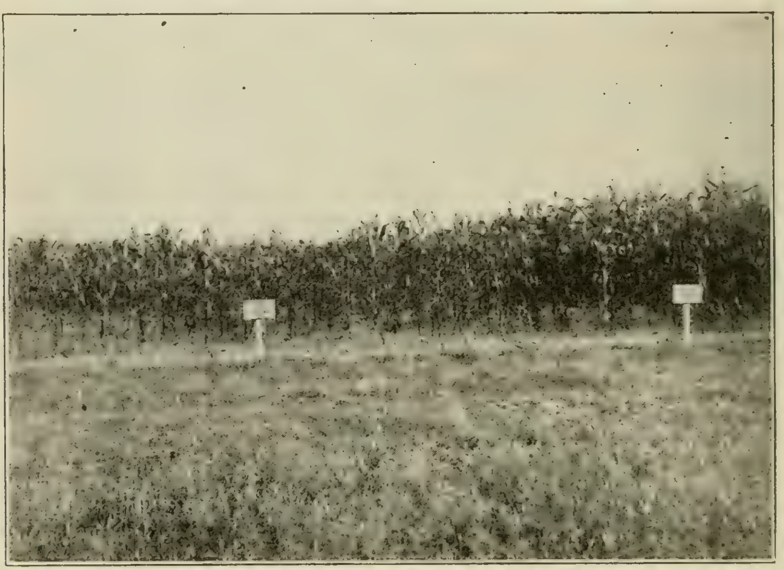
It will be seen that both nitrogen and phosphorus are strikingly lacking in most of these soil types, while potassium is usually fairly abundant. It will be noticed, too, that since the nitrogen supply of all soils occurs in the vegetable matter or humus, those soils that are blackest in color, such as the prairie of North Missouri are consequently highest in total nitrogen, while the dry, gravelly uplands of the Ozarks are lowest in nitrogen. The lack of phosphorus is most striking in the Ozark uplands also, although even in the prairie of North Missouri the lack is plainly evident.

It should be said regarding these analyses that while they do not as many believe tell exactly what fertilizers will give best results on any particular season, for the reason that the season affects the availability of the store of food which the soils contain, yet they nevertheless indicate clearly where the soils are deficient and what systems of farming one should adopt for the best ultimate returns. I may say, too, that our results to date show a very close agreement between these analyses and the produce which the various plant foods bring.

EXPERIMENTS ON THE NORTHEAST MISSOURI FLAT PRAIRIE.

Monroe City Field.

One of the first soils on which experiments were begun was the flat prairie soil of North Missouri, found most typically in the counties of Audrain, Monroe, Ralls, Pike, Montgomery, Boone, Randolph, Shelby and Marion, but occurring in greater or lesser areas in most of the counties of the northeastern quarter of the State. This soil while originally quite fertile, where the water could be successfully removed, has been depleted by constant cropping to corn, until today it stands in need of careful soil treatment if it is to yield the proper returns. The analysis of this soil, as we have already indicated, shows it to lack from one-third to one-half its nitrogen and approximately two-thirds its phosphorus, while the potassium supply is ordinarily ample if it can be made available to crops.



Manure and rock phosphate as compared with no treatment on corn. Monroe City Experimental Field, 1907. No treatment produced 37.4 bu. per acre; manure and rock phosphate, 56.1 bu. per acre.

EXPERIMENTS ON N. E. MISSOURI FLAT PRAIRIE (UNIONVILLE).

EXPERIMENTS ON CORN—1905.

Soil treatment.	Yield, Bu.	Increase, Bu.	Value of increase.	Cost of treatm't.	Net return.
No treatment	25.3				
Lime	33.5	8.2	$2.87	$ .50	+$2 37
Lime, phosphorus	35.0	9.7	3.39	2.90	+ .49
Lime, phosphorus, potassium	40.7	15.4	5.39	5.40	— .01

EXPERIMENTS ON CORN—1906-7.

Soil treatment.	1906.		1907.	
	Yield, Bu.	Increase, Bu.	Yield, Bu.	Increase Bu.
No treatment	32.3		63.4	
Cowpeas	19.6	Wireworms	69.0	5.6
Cowpeas, lime	23.6	Wireworms	73.8	10.4
Cowpeas, lime, phosphorous	38.9	6.6	71.4	8.0
Cowpeas, lime, phosphorous, potassium	38.3	6.0	80.1	16.7

FINANCIAL STATEMENT—1906-7.

Soil treatment.	1906.			1907.		
	Value of increase.	Cost.	Net return.	Value of increase.	Cost.	Net return.
Cowpeas	Wireworms	$2.00	— $2.00	$1.96	$2.00	— $ .04
Cowpeas, lime	Wireworms	2.50	— 2.50	3.64	2.50	+ 1.14
Cowpeas, lime, phosphorus	$2.31	3.90	— 1.59	2.80	3.90	— 1.10
Cowpeas, lime, phosphorus, potassium	210	5.15	— 3.05	5.84	5.15	+ .69

BASIS FOR CALCULATIONS.

Corn, 35 cents per bushel. Cowpeas, $2.00 per acre.

Lime—2,000 pounds applied. Cost $4.00 every eighth year—50 cents per year.

Phosphorous—200 pounds bones applied 1905, 100 pounds 1906-7. Cost $1.40 per 100.

Potassium—100 pounds potassium chloride applied 1905, 50 pounds 1906-7. Cost $2.50 per 100.

EXPERIMENTS ON N. E. MISSOURI FLAT PRAIRIE (MONROE CITY).

EXPERIMENTS ON CORN—1905.

Soil treatment.	Yield, Bu.	Increase Bu.	Value of increase.	Cost of treatm't.	Net return.
No treatment	43.4				
Lime	45.3	1.9	$ .66	$ .50	+ $ .16
Lime, phosphorus	53.2	9.8	3.43	2.90	+ .53
Lime, phosphorus, potassium	55.9	12.5	4.37	5.40	— 1.03

EXPERIMENTS ON CORN—1906-7.

Soil treatment.	1906.		1907.	
	Yield, Bu.	Increase Bu.	Yield, Bu.	Increase Bu.
Cowpeas	38.6	$0.00	44.2	6.2
Cowpeas, lime	50.9	5.9	51.0	13.0
No soil treatment	45.0		38.0	
Cowpeas, lime, phosphorus	55.7	10.7	54.4	16.4
Cowpeas, lime, phosphorus, potassium	52.6	7.6	55.3	17.3

FINANCIAL STATEMENT—1906-7.

Soil treatment.	1906. Value of increase.	1906. Cost.	1906. Net return.	1907. Value of increase.	1907. Cost.	1907. Net return.
Cowpeas	$0.00	$2.00	— $2.00	$2.17	$2.00	+ $ .17
Cowpeas, lime	2.06	2.50	— .44	4.55	2.50	+ 2.05
Cowpeas, lime, phosphorus	3.74	3.90	— .16	5.74	3.90	+ 1.84
Cowpeas, lime, phosphorus, potassium	2.66	5.15	— 2.69	6.05	5.15	+ .90

BASIS FOR CALCULATIONS.

Corn, 35 cents per bushel. Cowpeas, $2.00 per acre.

Lime—2,000 pounds applied. Cost $4.00 every eighth year—50 cents per year.

Phosphorus—200 pounds bone applied 1905, 100 pounds 1906-7. Cost $1.40 per 100 pounds.

Potassium—100 pounds. Potassium chloride applied 1905, 50 pounds 1906-7. Cost $2.50 per 100 pounds.

EXPERIMENTS WITH WHEAT.

Soil treatment.	Yield in bushels per acre. 1906.	Yield in bushels per acre. 1907.
Plot 1. Cowpeas	9.3	13.2
Plot 2. Cowpeas, lime	10.7	16.7
Plot 3. No soil treatment	2.6	12.1
Plot 4. Cowpeas, lime, phosphorus	17.5	22.2
Plot 5. Cowpeas, lime, phosphorus, potassium	18.9	23.7

INCREASE DUE TO SOIL TREATMENTS.

Soil treatment.	Bushels per acre. 1906.	Bushels per acre. 1907.
Plot 1. Cowpeas	6.7	1.1
Plot 2. Cowpeas, lime	8.1	4.6
Plot 4. Cowpeas, lime, phosphorus	15.1	10.1
Plot 5. Cowpeas, lime, phosphorus, potassium	16.3	11.6

FINANCIAL STATEMENT—1906-7.

Soil treatment.	1906. Cost of treatm't.	1906. Value of increase.	1906. Net return.	1907. Cost of treatm't.	1907. Value of increase.	1907. Net return.
Cowpea treatment	$2.00	$4.69	+ $2.69	$2.00	$ .77	— $1.23
Cowpeas, lime	2.50	5.67	+ 3.17	2.50	3.22	+ .72
Cowpeas, lime, phosphorus	5.30	10.57	+ 5.27	3.90	7.07	+ 3.17
Cowpeas, lime, phos., potassium	8.00	11.41	+ 3.41	5.15	8.12	+ 2.97

BASIS FOR CALCULATIONS.

Wheat figured at 70 cents per bushel, lime at 50 cents per acre, bone at $1.40 per 100, muriate of potash, $2.50 per 100.

One method of soil improvement. Cowpeas sown in corn at last cultivation. Monroe City Experimental Field, 1907.

It will be seen from the results at Monroe City that on corn the treatments that have brought the profitable returns are those of cowpeas and lime and of cowpeas, lime and phosphorus. The addition of potassium to the combination gave only a slight increase and the added expense cut down the net return. It will be observed, too, that when the plots are compared in such a way as to note the effect of the individual treatments, lime has given quite consistent returns as has also phosphorus, while both cowpeas and potassium are variable. In the case of the cowpeas this is partly due to the fact that cowpeas sown in the corn at the last plowing sometimes decrease the yield of corn slightly, especially when the latter part of the season is dry. The injury, however, is rarely of much importance, and is not usually comparable to the value to be received from their effect on after crops.

The results on wheat show again that the greatest financial return is secured with cowpeas, lime and phosphorus, although the treatment of cowpeas, lime and the complete treatment of cowpeas, lime, phosphorus and potassium both brought good financial return. They show, too, that phosphorus brought the largest return when the treatments are considered separately, while lime and cowpeas each gave a fair return. The potassium gave small return and did not pay in either case.

The results on corn at Unionville are very nearly the same as those at Monroe City, with the exception that in 1907, the phosphorus failed to give a return, while potassium in both 1905 and 1907 gave a good increase, paying out with a small net return in 1907. The crop of 1906 was practically a failure, due to wireworms.

It can be said in general regarding the results on both these fields that on this type of land the broad-casting of either bone or muriate of potash for corn will rarely be accompanied by large returns, at least, during the first two or three years. That, for wheat phosphorus will usually pay, as will also the use of cowpeas and possibly lime, while potassium will not.

The plant food problem is not the only one on this flat prairie. Its flatness and the exceeding closeness of the undersoil introduces a drainage problem which is a very serious one. Ordinarily the farmers rely on surface drainage through a bedding up of the land, in plowing, but it is very evident that if tile drainage can be successfully used, the soil will be greatly increased in its productive capacity. The general opinion among farmers is that the land is too impervious to underdrain economically, but not content with this opinion we have set out to prove whether or not underdrainage will pay. Two drainage fields were therefore laid out on this land, one at Monroe City in the fall of 1906, the other at Vandalia in the spring of 1907. The field at Monroe City was in corn this year and no increase in the corn crop was obtained this first season. At Vandalia, however, where the land was in cowpeas this year, the drained land gave an increase of 160 per cent over the undrained in the weight of hay produced, while the hay was at the same time very much better in quality.

It is not considered, of course, that these results are conclusive, as it is expected that the tile will increase in efficiency for several years, and the experimental plan includes a comparison of the yields of these drained and undrained areas for at least five years. One cause of the failure to show results on the corn at Monroe City was due to the fact that the wireworms injured the corn most on the drained land, although, of course, this would of itself indicate that the land was more inclined to wetness. All things considered, however, the results are very encouraging.

RECOMMENDATIONS FOR THIS SOIL TYPE.

The results of the experiments on this soil type to date, while of course not entirely conclusive, are sufficiently complete to allow of certain rather sweeping conclusions and recommendations.

THE HUMUS SUPPLY.

The fact that the soil shows a strong lack of nitrogen by its analysis, coupled with the benefit which these experiments, as well as the experience of farmers, show to be produced by clover and cowpeas, warrants the recommendation of building up the humus and nitrogen supplies. This can be done through the adoption of a systematic crop rotation which shall include a regular crop of clover or cowpeas every three or four years to be pastured off or fed back onto the land, as well as the frequent use of catch crops of cowpeas, rye and rape if possible, to be pastured or fed in the same way. The rotation will tend to maintain the humus and nitrogen already existing through a decrease in the number of corn crops grown and a greater use of clover and grasses. The clover or peas will add both nitrogen and humus if they are fed back onto the land. It should be said in passing that on this very flat land where clover does so poorly, the use of cowpeas is strongly recommended as a crop which will give the same benefit to the land as clover, in about one-fourth the time and with just as great profit when the method of handling them is once understood.

THE USE OF PHOSPHORUS.

As the analyses and experimental results show, phosphorus is one of the plant foods most sorely needed on this soil, and one which gives a large return. The use of 100 to 150 pounds of steamed bone meal with wheat will most surely pay in the increased yield as well as in the effect on the clover crop following. For corn, a better proposition is to apply 300 to 500 pounds per acre of ground rock phosphate—a cheap form of phosphorous—with manure on the sod land before breaking. Ultimately it is possible that the bone may be abandoned and the rock phosphate used entirely. The rock phosphate may be either scattered on the manure as it is made 60 to 75 pounds per ton, or it may broadcasted with a manure spreader on sod land that may or may not have been manured. An end gate seeder will also scatter the phosphate satisfactorily. A manure spreader is essential to the handling of manure in this system, a large number of acres being covered evenly rather than a few acres covered heavily and unevenly.

The application of 50 to 75 pounds of a complete fertilizer like ammoniated bone and potash applied in the hill for corn, will pay on ordinary seasons, although on dry seasons it may "fire" the corn.

THE USE OF LIME.

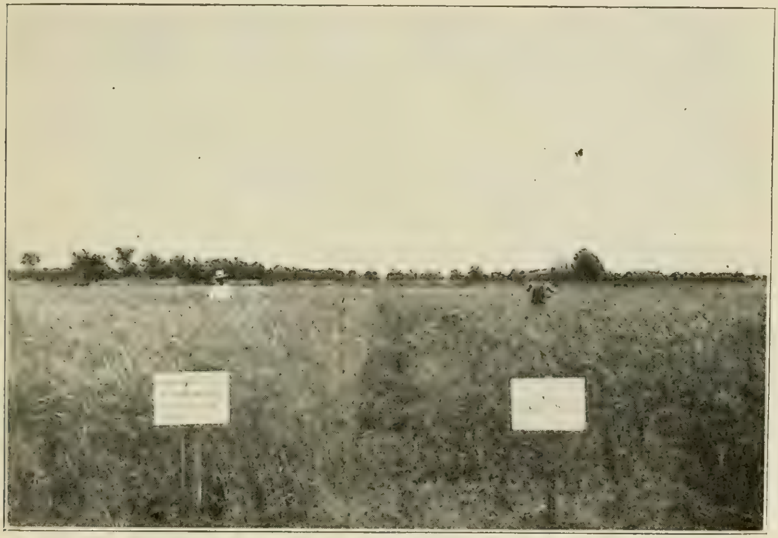
The experiments show a uniform benefit from lime, although in no case is the benefit very large. It is sufficient, however, to warrant the farmer in using some lime at least on the flatter and wetter areas of this land which are most inclined to sourness. The cheapest form is the ground limestone supplied most conveniently for Northeast Missouri by the Crystal Carbonate Lime Co. of Elsberry. It is best applied after plowing for corn or some other crop with an endgate seeder at the rate of 1,000 to 2,000 pounds per acre, allowing the after preparation of the land to work it thoroughly into the soil. At present it is recommended only experimentally on any but the wetter areas.

FEED CROPS AND SAVE MANURE.

No system of general farming will be permanently profitable on this soil without resorting to the feeding of animals and the careful return of manure to the land. For a time a rotation, including a frequent use of legumes, such as clover or cowpeas, will maintain the productiveness, but for the man who expects to live on his farm for twenty years, or if he expects to sell the land within ten years, some form of livestock farming will be very much more profitable. The land is too low in nitrogen and humus, as well as in phosphorus, to sell off crops for any length of time, even with a careful rotation. A word should be said here, too, regarding the common practice in many parts of the area of selling timothy hay. This crop removes an amount of fertility equal to half its value, and when the cost of production is figured, the margin of profit is very small. It is a practice that is suitable only to the renter or to a man under trying financial circumstances. Moreover, timothy is a very poor feed, except for horses and mules, and it should practically always be mixed with clover or fed in combination with clover or cowpea hay.

RESULTS OF EXPERIMENTS ON THE GRAY SILT LOAM OF SOUTHWEST MISSOURI (LAMAR).

I wish to call detailed attention to one more series of soil investigations which are especially interesting and valuable to the farmers concerned. These are the experiments on the gray silt loam of the more or less rolling prairie of Barton, Bates, Vernon and St. Clair counties. The soil is to be distinguished from the sandy type or the limestone soil of this region by its gray color, its fine character and its rather level stretches which frequently need drainage. It is a gray loam to a depth of eight inches, underlaid by a silty clay of a yellowish gray color, running into a reddish clay, frequently at depths varying from 2 to 3 feet. It will produce on an average about 25 to 30 bushels of corn, from 10 to 15 bushels of wheat and 20 to 25 bushels of oats. The analysis of this soil, as compared with a very fertile soil, is shown in the following table:



Effect of soil treatment on wheat. Lamar Experimental Field, 1907. No treatment produced 12 bu. per acre; cowpeas, phosphorous, potassium, lime treatment produced 25.8 bu. per acre.

The top 7 inches of an acre of very fertile soil contains.	Nitrogen, 5,800.	Phosphorus, 2,000.	Potassium, 5,300
An equal amount of this gray silt loam as shown by the Lamar analysis contains.....	2,480	445	3,835

It will thus be seen to lack approximately one-third its nitrogen, three-fourths its phosphorus and one-fourth its potassium. It has also been shown to be slightly acid in character, indicating its need of lime.

EXPERIMENTS WITH CORN—1906-7.—(LAMAR FIELD.)

Soil treatment.		Yield, 1906.	Bu. Increase.	Yield, 1907.	Bu. Increase.
Plot 1.	Nitrogen, phosphorus	40.5	5.0	25.2	4.6
Plot 2.	No soil treatment	35.5	....	20.6	....
Plot 3.	Nitrogen, potassium	38.0	2.5	32.5	11.9
Plot 4.	Phosphorus, potassium	47.5	12.0	41.3	22.0
Plot 5.	Nitrogen, phosphorus, potassium	44.0	8.5	41.3	23.3
Plot 6.	Fertilizer in hill 1906	49.5	14.0	....	....
	No soil treatment, 1907	....	....	18.0	....
Plot 7.	Nitrogen, phosphorus, potassium, lime	51.0	15.5	45.0	27.0

FINANCIAL STATEMENT—1906-7.

Soil treatment.	1906.			1907.		
	Value of increase.	Cost of treatm't.	Net return.	Value of increase.	Cost of treatm't.	Net return.
Nitrogen, phosphorus	$2.00	$2.57	— $ .57	$1.84	$3.40	— $1,56
Nitrogen, potassium	1.00	2.42	— 1.42	4.76	3.25	+ 1.51
Phosphorus, potassium	4.80	2.65	+ 2.15	8.80	2,65	+ 6.15
Nitrogen, phosphorus, potassium	3.40	3.82	— .42	9.32	4.65	+ 4.67
Fertilizer in hill	5.60	1.40	+ 4.20	....	....	....
Nitrogen, phosphorus, potassium, lime.	6.20	4.32	+ 1.88	10.80	5.15	+ 5.65

BASIS FOR CALCULATIONS.

Corn, 35 cents per bushel.
Nitrogen—Sodium nitrate, 1905, 50 pounds per acre. Cost $2.35 per 100 pounds.
Nitrogen—Cowpea treatment, 1906. Cost $2.00 per acre.
Lime—2,000 pounds applied every eighth year. Cost 50 cents per year.
Phosphorus—100 pounds. Bone applied. Cost $1.40 per 100 pounds.
Potassium—50 pounds potassium chloride applied. Cost $2.50 per 100 pounds.

EXPERIMENTS WITH WHEAT—1907.

Soil treatment.	Yield, Bu.	Increase, Bu.
No soil treatment	12.	....
Cowpeas, phosphorus	15.5	3.5
Cowpeas, potassium	14.0	2.0
Phosphorus, potassium	19.5	7.5
Cowpeas, phosphorus, potassium	21.0	9.0
Cowpeas, phosphorus, potassium, lime	26.0	14.0

FINANCIAL STATEMENT.

Soil treatment.	Value of increase.	Cost.	Net return.
Cowpeas, phosphorus	$2.31	$3.40	— $ 1.05
Cowpeas, potassium	1.12	3.25	— 2.13
Phosphorus, potassium	4.97	2.65	+ 2.32
Cowpeas, phosphorus, potassium	6.37	4.65	+ 1.72
Cowpeas, phosphorus, potassium, lime	9.73	5.15	+ 4.58

BASIS OF CALCULATIONS.

Wheat—70 cents per bushel. Cowpeas, $2.00 per A.
Lime—2,000 pounds per acre, applied once in 8 years—50 cents per annum.
Phosphorus—100 pounds bone applied. Cost $1.40 per 100 pounds.
Potassium—50 pounds potassium chloride applied. Cost $2.50 per 100 pounds.

It will be seen that, as the analysis of this soil would indicate, it is in need of all three of the elements, nitrogen, phosphorus and potassium, while lime is also needed as a corrective of acidity. The largest increases have come, therefore, where all fertilizer elements were added.

It will be noticed that on corn in 1906 the use of phosphorus and potassium has brought the largest increase for any two elements although this increase has been exceeded both by the complete treatment, including lime, and by the use of fertilizer in the hill. When financial return is considered, it will be seen that the fertilizer in the hill easily leads with a net return of $4.20 per acre, with the combination of phosphorus and potassium second and the complete treatment third. The rest of the treatments were unprofitable this season.

In 1907 it will be observed that while the actual yields of corn are less, the increase from the treatment is much greater, the yield having been more than doubled on three of the treated plots, thus indicating the same thing that has been observed on other fields, that the longer the experiments are continued, the better will be the returns.

The net return is also seen to be much greater in 1907, all the treatments having paid well, excepting the nitrogen and phosphorus, which showed a loss, and the nitrogen and potassium, which showed a gain of only $1.51 per acre.

The results with wheat are on the whole very much the same as those for corn, showing the largest returns from the phosphorus, potassium, from the nitrogen, phosphorus and potassium, and from the complete treatment. The greatest net return is derived from the complete treatment, where the effect of the lime is very apparent.

When results on both corn and wheat are compared, it will be seen that the four elements are almost equally beneficial, in the return which they bring, and the more complete the treatment, the larger the increase, and usually the larger the net return.

RECOMMENDATIONS FOR THIS SOIL TYPE.

From the results of these experiments some very specific recommendations can be made regarding the handling of this soil. Moreover, the character of the soil is such that some treatment of the land is almost essential to consistent crop returns, and the farmer, who is to make the highest profits on this soil, must give particular attention to its peculiarities.

CROP ROTATION.

The constant cropping of this land to corn without commensurate return in the form of manure, or the feeding of animals on the soil, will soon reduce its productive capacity to an unprofitable condition. A crop rotataion, which shall include corn only once in three to five years, with a liberal use of cowpeas, is essential to the greatest profit on this land.

THE USE OF COWPEAS.

The cowpea is to be the salvation of this soil, and a rotation should be planned which shall include cowpeas two or three times within five years. Such a rotation would be corn (with cowpeas sown at the last plowing), cowpeas, wheat (followed by cowpeas), and grass, the fourth year; or when the land has been built up so that clover will grow, use clover the fourth year, or clover and timothy the fourth and fifth.

THE USE OF LIME.

The experiments indicate that lime is essential to the highest production on this soil for the purpose of correcting the acidity. Use 2,000 pounds of ground limestone per acre once in 6 to 10 years, preferably after plowing for corn, working it in well by the after preparation of the land. Any sort of lime will answer for this sweetening, except that from the gas works, but the ground limestone is usually cheapest. Apply with an endgate seeder.

THE USE OF FERTILIZERS.

The use of 50 to 70 pounds of a complete fertilizer, such as ammoniated bone and potash, put in the hill with a fertilizer planter, will usually bring a good net return on this land, except on a dry season, when the corn may sometimes fire from its use. It will be better in the end, however, to build up the land by feeding and rotation of crops for the effect on the corn crop. The use of fertilizer broadcast, using 100 pounds of steamed bone meal and 50 pounds of muriate of potash per acre, will usually pay on corn, if properly put in. It should either be plowed under, or it should be drilled in with a fertilizer grain drill before the corn is planted. The same application will also pay on wheat, if properly put in. It will pay much better, however, if the wheat land has been built up in nitrogen and humus by growing cowpeas, and if it has previously been sweetened with lime.

THE SAVING OF MANURE.

Manure must be scrupulously saved and returned to the land, if it is to be kept permanently productive. A manure spreader will pay on every farm of over 100 acres, where cattle are lot or stable fed. A good permanent practice: If 50 to 75 pounds of raw rock phosphate be applied to every ton of manure before applying to the land, and then if this manure is put on at the rate of 6 tons per acre once in four years, before corn, this will be found one of the very best practices possible. The phosphate will build up the soil in phosphorous, in which it is so deficient, the return of the manure will help to maintain the nitrogen and potassium supplies. Now, if a rotation is followed, which shall include the frequent use of cowpeas or clover, all of which are fed back on the land, and, further, if the land be sweetened by lime, the farmer is in position to secure the largest return from his land at the least cost.

THE EFFECT OF TILE DRAINAGE ON THIS LAND.

An experiment in tile drainage was put out on this land in the fall of 1906, four acres being drained and an adjoining four acres being undrained. The idea was to see whether or not the land would drain profitably. The general opinion among farmers is that it is too tight below. The yield of corn from the drained land this past season (1907) exceeded that on the undrained 8.4 bushels per acre. It is believed that the tiles will increase in efficiency from year to year, and that the gains for future years will be greater. This year was a dry year in Barton county, also. On the flatter areas of this gray soil underdrainage will undoubtedly be found profitable.

DISCUSSION.

Q. By ground limestone you do not mean burnt limestone, do you?

Prof. Miller: No, finely ground limestone rock.

Q. What is the proper time for plowing under cowpeas?

Prof. Miller: We usually plow them under about the time they begin to set pods—maybe a little earlier—but that's the best time to plow them under, everything considered.

Q. How would it affect the land to let them ripen?

Prof. Miller: Just the same as if plowed under. We can not very well turn the hogs into these fields and have them feed on the cowpeas, but where they are fed off we get practically the same fertility back on the farm through the manure.

Q. Can you plow the cowpeas under green?

Prof. Miller: Yes, but it is usually best to wait until they have nearly matured, unless a crop like wheat is to follow, and one cannot wait.

Q. What time do you sow your cowpeas, and how much to the acre?

Prof. Miller: We sow them whenever we can, depending on what they follow. Not many sow them in the corn. Cowpeas should not be sown in this part of the State until about the last of June. Cool weather stunts them. The last of June or the first of July is the best time to sow them.

Sometimes they are put in corn at the last cultivation. If the season is ordinarily moist during the latter part of the growing season, we will get good growth; if the season is dry, we will get poor growth. Cowpeas are not always successful in the corn, but ordinarily, if you put them in with a one-horse drill, there is not very much danger. This sometimes happens: If the latter part of a season is dry, the sowing of cowpeas may cut your corn yield at the rate of 5 or 6 bushels; but the benefit which follows will usually very much more than pay for the loss to your corn. In a good year you will probably never see any difference in the yield of corn.

Q. How much do you sow per acre?

Prof. Miller: About one bushel per acre. That depends, however, on what you want to produce, whether seed or feed. Of the New Era variety we sow only three pecks to the acre. If you will write the Experiment Station you can get a bulletin giving you information on cowpeas.

Q. Will land that is rich in humus really become sour?

Prof. Miller: Yes, some of the richest lands in the United States are sour.

Q. Do you take your manure direct from the barn?

Prof. Miller: Yes.

Q. What capacity manure spreader do you recommend?

Prof. Miller: Sixty bushels is extreme for two horses. If you use a 70-bushel spreader with four horses it is all right, but that is getting most too large for the average farmer.

Q. Is there any difference in the value of the manure to the ground when it is spread with a fork or with a spreader?

Prof. Miller: No, except the spreader makes it go farther.

Q. I notice that Hopkins says that the land that is rich in humus, and is sour, which turns the blue litmus paper red, is the land on which to use phosphorus.

Prof. Miller: That is true; but we have very few of those lands in Missouri. While on this, I will say that if you wish to use phosphorus, the very best way to use it is in connection with manure. Scatter the ground rock phosphate over the manure on the ground. The use of manure to which ground rock phosphate has been added has very much increased the net return.

Q. I have got a piece of land which has been idle for some time. It has a heavy growth of weeds, higher than your head. Would you burn those weeds off or plow them under?

Prof. Miller: For corn, if you can plow them early enough, plow them under. If you cannot plow until late, then I would burn them off.

GROWING AND SELECTING SEED CORN.

(L. B. Clore, Franklin, Indiana.)

There are more things to be considered in growing a successful corn crop than the selection of the seed. I would like to go back, in the first place, to the condition of the soil, which is one of the first essential things toward a successful corn crop. We cannot rob our soil of all of the elements that go to make corn, never replacing any of the elements lost, and expect to have a successful corn crop. We want a soil with plenty of humus in it; we ought to grow plenty of clover—ought to grow it every third year. We never put in a corn crop unless we put it after a clover crop, and with this we want plenty of barn yard manure. We never use commercial fertilizers except on the wheat crop. We use commercial fertilizers when sowing our wheat. Of course this materially increases the yield of wheat, it is the foundation for a clover crop, and we get the benefit in our corn. I think that after we have a soil in good condition for a corn crop we may abuse it in a good many ways: For example, by letting stock run on the field in the winter time. I don't believe the freezes of one winter will take away the effects of trampling the ground while it is wet, and consequently I think a great deal of corn is injured by the trampling of the ground in the winter time. Wherever a hoof mashes the soil down, the chances are that a clod is formed there, and we cannot retain moisture where we have more clods than pulverized soil. Therefore, I think the care of the soil, the building up of the soil, and the caring for it through the winter time has much to do in raising a successful corn crop. Some times the corn will begin to turn yellow, and the farmer complains that probably worms or some insect are working on the roots of the corn, when, if the trouble could only be traced back, he would find that the soil was not right; he would find those hard cloddy lumps that have no moisture; and in fact I think this has been the real cause of yellow corn and dwarfed corn, rather than insects working on the roots.

Drainage—After the soil the drainage is next to be considered as one of the essential factors in a successful corn crop. I want to say that where I grew my best corn last year I had a common system of drainage, a shallow system, put in early before we had our better outlets. Later we put in a deep system of drainage—a draw system which cost us $17 an acre—and I believe it is the best system we can use on our soil. I don't know the condition of *your* soil, but nothing will pay better on our soil than this system of drainage.

Plowing—If we have our soil in good condition, I prefer fall plowing. I don't know whether that is practical with you or not. It is not practical on all our soils, but for bottom soils that do not overflow or wash, and for black loamy soils, we find it very profitable to do fall plowing for several reasons: It helps us along materially in the spring with our work and it tends to do away with cut worms and insects; in turning the soil up the eggs are broken and we are not bothered with them. Further than that, we think our soil holds moisture better through the season. In the breaking of the soil, we all use jointers. The jointer is more valuable to me than the plow. It is in fact a small plow that fastens on to the beam in front of the regular plow and this fills the trash in the bottom of the furrow and leaves the soil in better condition for a seed bed. I would advise you all to buy a jointer. It will fit most any plow, and if it don't fit the plow you have, throw it away and get a new one. It will pay you to do it. Where there is quite a little trash in opening up the land, it is most generally necessary to remove the jointer until you get the land open. After you once get the land open, you can plow very trashy ground. I would advise, where fall plowing is practiced, that you do not let it lie in the spring and dry out. I think that is one of the greatest mistakes which farmers make in fall plowing. You should get into the land in the spring just as soon as possible, just as soon as the ground is in condition, not too wet, even if you expect to work it up later on; because if you let the ground once dry out it is almost like breaking it new if inclined to run together at all. You should not, however, work with the ground when it is the least bit wet at any time, because it injures the soil and also the crop.

Preparing the Seed Bed—I am a great believer in the preparation of the seed bed. I think we cannot be too careful in preparing the seed bed. In fact I think it is well, after we think we have a good seed bed, to go over it again two or three times to be sure we have got a good seed bed. We should *more than satisfy* ourselves. I think there is no time in the history of the corn crop when we can cultivate the corn as well as before planting it. You can cultivate all of the ground at this time and it is the best cultivation you can give it.

Kind of Corn, Number of Grains Per Hill, etc.—Now, I may get into trouble when I say that I prefer checked planting. How many like this plan? Quite a number, I see.

As to the number of grains to the hill, that depends upon what we expect to do with our corn. I believe that if we do not care for quality we can get more corn with three stalks to the hill on good soil than we can with two, but if we look to *quality*, I believe that we can accomplish more by two stalks to the hill than we can with three. I would have two stalks in every hill if I could have my way, for if we have a complete stand with two stalks to each hill, with an ear of corn on each stalk weighing a pound, we are growing 100 bushels of corn to the acre, and we ought to be satisfied with that result. There is no reason why we should not be growing that number of bushels to the acre.

Barren Stalks—I don't know whether or not you have been conducting any experiments in regard to barren stalks in the field. In our state we have 15 to 20 per cent of barren stalks. Now I am not going to say that you have that many (probably not) but I will say that if you have not made an investigation and made an actual count you will be surprised when you go through your field and select out 100 ears, taking them as they come, and counting the barren stalks.

Cultivation—After we have the corn planted we like to begin cultivation at once. The condition of the soil, the kind of soil, depends on cultivation. Should a soil be loose and open I think a weeder a very useful tool, or a small spike toothed harrow, but if the soil is tight this implement will do no good.

If we use the weeder or the spike-toothed harrow it is necessary to use it early. My experience has been that we cannot use this tool after the corn is coming through the ground, or approaching the top of the ground. That is a stage when it is easily broken off. We can use the weeder to good advantage after the corn is up two or three inches. You might think that we would tear it all up, but we don't break off as many stalks as would be supposed. Then we like to follow cross-cultivation, deep at the start, and as the plant grows we like to get shallow. We are able in this way to keep our corn rather clean.

Seed Proposition—I have been trying to improve my corn by breeding and selection. If there is anything to be gained by the improvement of corn I like to get the benefit of it, and I have been carrying on plot breeding work. The theory is all right, it looks practical, and I have gotten good results, but I am compelled to believe by my actual experience that I am getting better results by selection. Of course the breeding plot work is carried on on rather a small scale, and we don't have the chance of selecting from a number of acres the better ears of corn. I don't make it a rule to get my seed corn until we are harvesting our main crop and I am not what you would call a large farmer. In fact, we don't have the large farmers that you have here. Before the Chicago show my man found an ear of corn and recognized that he had a good one, and it was the ear of corn for which I paid $250. I think I heard four or five hundred people say "That man Clore hasn't got any sense, paying $250 for one ear of corn." I was representing

Indiana at that time, I was a hoosier, and I had plenty of patriotism for my state. Iowa had taken a great deal of pleasure in advertising it far and wide that she held the record on a $150 ear of corn, and I had that state pride to back me up. I know from the corn I have seen here that you have men here able to grow prize-winning corn, and I hope that if you show at the next international you will do as I did.

Selecting Seed Corn—Well, we have a box on our wagon bed when harvesting, and when we find an ear of corn growing on a stalk not too tall, a good growthy stalk—we are not looking for that low down stalk, but a thrifty stalk not too tall, with the ear hanging on the stalk right, no disease about it, no smut—we want that ear of corn. It is worth a great deal. You can hardly place a value on it. Put it in your box and care for it. We gather up for our own breeding three or four times as much as we need, care for it, and in the spring we go through it and select out the best. We keep that ourselves, because we expect to build up our corn from that selection.

Now in regard to the building up of seed by breeding: I have been carrying that on and have found it successful. We find that the yield representing the different individual ears that were planted run from 57 bushels to the acre with no good seed ears, with 4.6 per cent of barren stalks and 7.3 per cent of suckers, as compared with 92 bushels to the acre, with 31 good seed ears, and no suckers, and with 106 bushels to the acre with 45 good seed ears and no barren stalks with only 2 per cent of suckers, and we have quite a number of ears that will run over 100 bushels to the acre.

Now I presume most of you know how this single ear breeding system is carried out. I might say that to begin with we select out the desired number of ears, take ten for example. After we have selected those ten individual ears we make composite samples of probably a dozen or two of the best we can find and breed our rows with those. Plant rows 1 and 3 and 5 with our composite samples. Take ear No. 1 and plant in row No. 2, and ear No. 2 in row 4, and so on. We go through and detassel the individual ears; that does away with inbreeding. They cannot fertilize themselves, and the theory is that we get a stronger plant. I don't know whether we do or not. But understand my general crop is planted from the very best ears of the entire crop. It is a careful selection, and I believe I can do more good and improve my corn quicker by careful selection than by breeding.

Then comes up the theory of breeding to change the content of corn, to make it higher in protein. It is thought we can change the analysis of corn; but my experience has been that when we are adding protein we are losing something else, and I have decided that I will go on and improve the corn and get the protein in some other way. I have dropped that work and shall proceed by selection altogether.

The Individual Ear Test—For this test, we take a tray, 36 inches long and 18 inches wide, not over an inch and a half deep, which we fill with sand, sawdust or dirt. We pick up ear No. 1. It looks good. We take out five kernels and place them in row No. 1 in the first section, and we place the ear in our rack that we have built for our whole 36 ears. Then we pick up ear No. 2 and go through the same process. If that ear looks good we take out five kernels and place them in row No. 1 in the second sections, and place the ear No. 2 next to ear No. 1 in the rack. After we have the first row placed we follow the second row in the same way, and by placing them carefully we are not apt to get them mixed. Then we place a cloth over this. You may moisten the dirt before or after you place the cloth on. I usually place the cloth on first and then moisten the dirt through the cloth. Then I put a heavier cloth on top of that to hold the moisture, and place the tray any place where the temperature is right to sprout the corn; and within two or three days you ought to be able to determine the test. Just roll the cloth back and you can see at a glance the kernels that have sprouted. If in the 4th or 5th day the kernels have not sprouted, you had just as well go to the rack and remove that ear, as it is no good; but where the kernels have sprouted, the ears from which they were taken are all right and should be saved and planted. Now, we don't always get a perfect stand after we have followed that plan, but it does help to draw out a great many of the ears of corn that won't grow; in fact, you can pick out the ears of corn that have weak germs and throw them out. But it has happened that you can pick out five kernels from an ear which will sprout, but the ear will not grow. My observation has been that ears are spotted. We might select a kernel from one part of the ear that would grow and a kernel from another part which would not grow.

DISCUSSION.

Q. How deep do you plow?

Mr. Clore—We plow down pretty well—7 or 8 inches.

Q. Do you use a gang plow?

Mr. C.—No, we use a single riding plow.

Q. Do you make any difference in the depth you plow in fall and spring?

Mr. C.—No, just about the same depth.

Q. Does the depth to which we should plow depend in any way on the kind of soil?

Mr. C.—I suspect there are conditions which demand a much shallower plowing.

Paul Laughlin of Rich Hill, who won the First Prize in the Boys' Corn Judging Contest.

Q. Do you use a disk or shovel plow?

Mr. C.—A shovel plow.

Q. Four, six or eight shovels?

Mr. C.—Four to the side; what we call the Eagle plow; eight small shovels which cover the ground pretty thoroughly.

Q. In the general crop, do you detassel any of the rows at all?

Mr. C.—I do not. I have gone through and looked after stalks with smut and barren stalks; but detasseling is a big proposition when it comes to the actual work. It is a good theory and will do to talk about.

Q. What do you think about inbreeding affecting barren stalks?

Mr. C.—I think there are other conditions which affect them as much as inbreeding. For example, we get our corn too thick, or the season can have some effect on barren stalks.

Q. Do you grow your ears close to your stalk?

Mr. C—I don't like the shank too long, but like it to hang down a little so that the water won't run down the shank.

Q. Do you use a grading machine?

John E. Eames of Montgomery City, who won prize for largest yield—23 bushels and 28 lbs. on one-fourth acre.

Mr. C.—I think the grading of seed corn is very essential. Of course where we are planting a small crop it is worth while to use a great deal of pains in selecting the seed. There are a number of grading machines on the market. Some of them are very good. I have used one that works very well in removing the large round kernels from the butt of ear, but have never been able to get one that would take out the small kernels. It strikes me that a farmer should do this—go over the kernels and remove with a pen knife the odd-shaped irregular kernels, putting the good kernels in one box or bucket and the undesirable ones in another. It is worth your while.

Chester Matheny of Miami, who won the Silver Trophy.

Q. What kind of corn do you find most prolific?

Mr. C.—That is a question I can not answer. I think we should study our soil and our climatic conditions, and experiment with the various varieties of corn and determine for ourselves the most profitable corn to grow. My experience has been that we are growing our corn a little large to mature well. I want to grow it as large as I can as long as it will mature safely one year with another. We don't want to grow a variety that will not give us many bushels to the acre, consequently I think we cannot name a variety that is most prolific for all soils. The only way we can arrive at any definite basis is to experiment on our own farms. Take a half dozen varieties, plant them side by side, being careful that the condition of the soil is the same, harvest, and determine which variety brings the best returns. It will be worth your while to do this.

Q. If you plant several different varieties together, they will mix.

Mr. C.—Yes they will, but we can get some idea as to how they will produce. You can get some idea as to the yield of each variety, one as compared with another.

Q. Do you like white or yellow corn?

Mr. C.—It depends on conditions, which, however, are generally such that I can only raise white corn. We are not large farmers, and we have to furnish our neighbors what they want. Even as it is we sometimes get our corn mixed. We find that corn will mix at a distance of one-half mile to a mile. We can always find those stray yellow kernels in the white corn or the white kernels in the yellow corn.

Q. How late do you cultivate?

Mr. C.—That depends on the condition of the weather, soil, etc. We must study the conditions under which we are growing corn to be successful. I could not outline a plan that would be best for all to follow, but each one must study the conditions of his own soil.

Q. Do you cultivate your own land level?

Mr. C.—Yes.

Q. What kind of corn do you grow?

Mr. C.—Johnson County White—a cross of Boone County White and Forsyth Favorite.

Q. Why do you cross them?

Mr. C.—Those of you familiar with Boone County White know that it is a rather smooth corn. The Forsyth corn is thick and has a very rough kernel, and we think we get a better corn by crossing the two. We get a rough corn, depth of kernel, and a better yielding corn.

Q. Do you prefer a large or small cob?

Mr. C.—I prefer one of medium size.

Q. What do you do to keep the suckers out of your corn?

Mr. C.—Pull them out.

Q. Is it profitable to do it?

Mr. C.—It depends on the conditions which follow after. If it turns off dry let them alone, but if you can pull off the suckers before they get too large and if we have plenty of rain, then it is profitable.

Q. How do you manage to get this uniform stand you speak of?

Mr. C.—Well, we try to plant two stalks in each hill, and then we are very careful in the grading of our seed.

Q. From which do you get the strongest sprouts—the white or yellow corn?

Mr. C.—From the broad and deep grains.

REPORT OF THE MISSOURI STATE CORN SHOW, 1908,

TOGETHER WITH LIST OF AWARDS.

The Missouri State Corn Show, which was held at Columbia during Farmers' Week, January 7-10, was a success in every way. The number of entries was about the same as in 1907, although the quality of corn was on the whole considerably better. The fact that practically all of South Missouri beyond the first two tiers of counties south of the river was dry this season, accounts largely for the fact that no more corn was shown this year than last.

The judging was done by Mr. L. B. Clore of Franklin, Indiana, the originator of Johnson County White Dent Corn and the winner of the Sweepstakes prize at the National Corn Show at Chicago the past fall. Mr. Clore is one of the leading corn breeders of the United States, and has given a great deal of attention to the matter of corn shows during the last few years. He is a recognized authority on corn breeding and corn judging.

The total number of entries in the show was 303, classified as follows:

Class A.	Section 1	(Best bushel of yellow corn)		8
	Section 2	(Best bushel of white corn)		6
Class B.	Section 1	(Best 10 ears yellow)	North of the river	46
	Section 2	(Best 10 ears white)		36
Class C.	Section 1	(Best ten ears yellow)	South of the river	10
	Section 2	(Best ten ears white)		11
	Section 3	(Best ten ears mixed)		2
Class D.		(Best single ear of yellow)		31
Class E.		(Best single ear of white)		24
Class F.		(For best in the variety)		48
Young Men's Class		Best 10 ears white and best 10 ears yellow		30
Boys' Class		Best 10 ears white and best 10 ears yellow		51
	Total			303

LIST OF AWARDS AT THE MISSOURI STATE CORN SHOW, AT COLUMBIA, MO., 1908.

BEST BUSHEL OF YELLOW CORN IN EAR.

1st prize	H. C. Crain, Elmo.	(Reid's Yellow Dent.)	Score 83½
2nd prize	Geo. H. Sly, Rockport.	(Reid's Yellow Dent.)	Score 83
3rd prize	F. M. Riebel, Arbela.	(Reid's Yellow Dent.)	Score 81

BEST BUSHEL OF WHITE CORN IN EAR.

1st prize	J. E. Matheny, Miami.	(Boone County White).	Score 82
2nd prize	Geo. H. Sly, Rockport.	(St. Charles White.)	Score 80¼
3rd prize	E. L. Hughes, Glasgow.	(Farmer's Interest.)	Score 80

SWEEPSTAKES prize for the best bushel, H. G. Crain, Elmo. (Reid's Yellow D.) Score 83½

BEST BUSHEL SHELLED CORN.

1st prize	Chris Ohlendorf, Boonville.	(Cartner.)	(Yellow.)
2nd prize	Chris Smith, Bunceton.	(Cartner.)	

BEST BUSHEL SHELLED CORN (White.)

1st prize	Wm. Johnmeyer, Boonville.	(Boone County White.)
2nd prize	Wm. Muntzel, Boonville.	(Boone County White.)

BEST TEN EARS OF YELLOW CORN GROWN NORTH OF THE RIVER.

1st prize	E. B. Crain, Elmo.	(Reid's Yellow Dent.)	Score 89
2nd prize	H. C. Crain, Elmo.	(Reid's Yellow Dent.)	Score 88.7
3rd prize	F. C. Harlan, Troy.	(Reid's Yellow Dent.)	Score 88.
4th prize	J. H. Shirky, Norborne.	(Reid's Yellow Dent.)	Score 87.7
5th prize	F. M. Riebel, Arbela.	(Reid's Yellow Dent.)	Score 87.6
6th prize	E. L. Newlon, Lewistown.	(Reid's Yellow Dent.)	Score 86.4

BEST TEN EARS OF WHITE CORN GROWN NORTH OF THE RIVER.

1st prize,	E. L. Hughes, Glasgow.	(Farmer's Interest)	Score 83.5
2nd prize	Geo. H. Sly, Rockport.	(St. Charles White.)	Score 82.7
3rd prize	C. E. Scott, Tarkio.	(Boone County White.)	Score 81.2
4th prize	Wm. Wallace, Vandalia.	(Boone County White.)	Score 80
5th prize	H. B. Hughes, Glasgow.	(Farmer's Interest.)	Score 79.5
6th prize	J. G. Douglas, Shelbina.	(Boone County White.)	Score 77

BEST TEN EARS OF YELLOW CORN GROWN SOUTH OF THE RIVER.

1st prize	J. E. Matheny, Miami.	(Reid's Yellow Dent.)	Score 80.2
2nd prize	Harry Cornman, Cole Camp	(Reid's Yellow Dent.)	Score 79.2
3rd prize	Chris Ohlendorf, Boonville.	(Reid's Yellow Dent.)	Score 78.5
4th prize	Wm. Johnmeyer, Boonville.	(Golden Beauty.)	Score 70.5
5th prize	Wm. Johnmeyer, Boonville.	(Leaming.)	Score 68.5
6th prize	Wm. Johnmeyer, Boonville.	(St. Chas. Yellow.)	Score 68

BEST TEN YEARS OF WHITE CORN GROWN SOUTH OF THE RIVER.

1st prize	J. E. Matheny, Miami.	(Boone County White.)	Score 84.5
2nd prize	J. M. England, Callao.	(Boone County White.)	Score 83.0
3rd prize	C. Ohlendorf, Boonville.	(Boone County White.)	Score 81.5
4th prize	M. L. Brockays, Princeton.	( )	Score 79.5
5th prize	H. P. Muntzel, Boonville.	( )	Score 79.0
6th prize	Wm. Johnmeyer, Boonville.	(Boone County White.)	Score 70

BEST TEN EARS OF MIXED CORN SOUTH OF THE RIVER.

1st prize	Martin Johnmeyer, Boonville.	Score 78.
2nd prize	John H. Lowe, Chillicothe.	Score 69.5

SWEEPSTAKES IN 10 EARS YELLOW. (Open to the State.)

E. B. Crain, Elmo.	(Reid's Yellow Dent.)	Score 89

SWEEPSTAKES IN 10 EARS WHITE. (Open to the State.)

J. E. Matheny, Miami.	(Boone County White.)	Score 84.5

BEST EAR OF YELLOW CORN. (Open to the State.)

1st prize	Paul Crain, Elmo.	(Reid's Yellow Dent.)	Score 94
2nd prize	W. H. Briggs, New London.	(Reid's Yellow Dent.)	Score 93.6

BEST EAR OF WHITE CORN. (Open to the State.)

1st prize	T. R. Douglass, Shelbina.	(Boone County White.)	Score 94.9
2nd prize	J. E. Matheny, Miami.	(Boone County White.)	Score 90.1

SWEEPSTAKES FOR BEST EAR. (Open to the State.)

J. R. Douglass, Shelbina.	(Boone County White.)	Score 949.

The men who had the highest scoring samples of corn in each variety were as follows, in order of the scores:

REID'S YELLOW DENT.

H. C. Crain, Elmo; F. M. Riebel, Arbela; E. L. Newlon, Lewistown; J. C. Wigginton, Louisiana; H. T. Mackey, Clarksville; W. C. Watson, New London; O. A. Barnes, Memphis; Edw. Easley, Columbia; D. A. Hudson, Route No. 5, Trenton; C. A. Haynes, Trenton; H. C. Again, Columbia; Witten Hardware Company, Trenton; Eli Oyer, Centralia; J. C. Currie, Tarkio; Clayton Scott, Tarkio; D. C. Lentley, Trenton, and L. D. Chapman, Mendon.

BOONE COUNTY WHITE.

J. E. Matheny, Miami; C. E. Scott, Tarkio, and C. A. Haynes, Trenton.

LEAMING.

J. I. Mansur, Richmond.

FARMERS INTEREST.

E. L. Hughes, Glasgow, and H. B. Hughes, Glasgow.

LEGAL TENDER.

H. R. Scott, Tarkio.

ST. CHARLES WHITE.

Geo. H. Sly, Rockport.

ST. CHARLES YELLOW.

C. A. Griesenauer, O'Fallon.

GOLDEN BEAUTY.

Wm. Johnmeyer, Boonville.

CARTNER.

Chris Smith, Bunceton.

YOUNG MEN'S CLASS.

BEST TEN EARS YELLOW CORN.

1st prize	E. B. Crain, Elmo.	Score 78.5
2nd prize	Arch Riebel, Arbela.	Score 76.0
3rd prize	Henry Ohlendorf, Boonville.	Score 75.0
4th prize	F. M. Riebel, Arbela.	Score 73.0
5th prize	Albert Johnmeyer, Boonville.	Score 72.2

BEST TEN EARS WHITE CORN.

1st prize	Earl Clayton, Hamburg.	Score 81.7
2nd prize	Irl W. White, Clarksdale.	Score 80.0
3rd prize	Frank A. Currie, Tarkio.	Score 79.0
4th prize	Adolf Wasel, Auxvasse.	Score 78.2
5th prize	Robert Merryman, Laredo.	Score 78.0

BOYS' CLASS.

BEST TEN EARS YELLOW CORN.

1st prize	Rollin Crain, Elmo.	Score 79.
2nd prize	Paul Crain, Elmo.	Score 78.7
3rd prize	Chas. J. Currie, Tarkio.	Score 75.
4th prize	Vincent Bondrean, Gregory.	Score 74.
5th prize	George Ohlendorf, Boonville.	Score 73.5
6th prize	Clark Riebel, Arbela.	Score 73.
7th prize	J. E. Shirky, Norborne.	Score 72.7
8th prize	Walter Ohlendorf, Boonville.	Score 71.
9th prize	Fredie Ohlendorf, Boonville.	Score 70.2
10th prize	J. L. Craigmile, Tarkio.	Score 69.5

BEST TEN EARS WHITE CORN.

1st prize	Chester Matheny, Miami.	Score 79.7
2nd prize	Herbert Prettyman, Fairfax	Score 78.
3rd prize	Chalmer Clayton, Hamburg.	Score 77.2
4th prize	Raymond Wasel, Auxvasse.	Score 76.
5th prize	Chas. J. Currie, Tarkio.	Score
6th prize	Clark Riebel, Arbela.	Score
7th prize	Robert Muntzel, Boonville.	Score 74.7
8th prize	Hiram W. Smith, Maitland.	Score 73.7
9th prize	Claude L. Bryant, Cyrene.	Score 73.
10th prize	Gene Williams, Farmington.	Score 71.5

SWEEPSTAKES, BEST TEN EARS IN BOYS' CLASS.

Chester Matheny, Miami.	Score 79.7

LIST OF CERTIFIED CORN JUDGES.

Thirty men took the examination for recognition as a certified corn judge, twelve of whom did sufficiently creditable work to warrant the judges in granting them certificates. The list of successful men follows: W. P. Brinkley, Linneus; L. B. Bell, Monroe City; C. C. Cockefaire, Unionville; P. E. Crabtree, Hannon; R. S. Harriman, Pilot Grove; E. L. Hughes, Glasgow; S. M. Jordan, Columbia; C. C. Lockwood, Columbia; E. L. Newlon, Lewistown; H. R. Nelson, Springfield; F. M. Riebel, Arbela; Geo. H. Sly, Rockport.

The winner in the corn judging contest held in the Boys' Short Course was Paul Laughlin of Rich Hill, Bates county.

The boy who won the first prize for the best essay describing his methods of growing corn in the contest was John Tharpe of Armstrong, Howard county.

M. F. Miller, Secretary.

SESSION

Missouri State Dairy Association.

An abbreviated report of the meetings held during Farmers' Week in the Agricultural College, January 9-10, 1908.

THE TRANSMISSION OF DAIRY QUALITIES BY THE SIRE.

(C. H. Eckles, Professor of Dairy Husbandry, Missouri Agricultural College.)

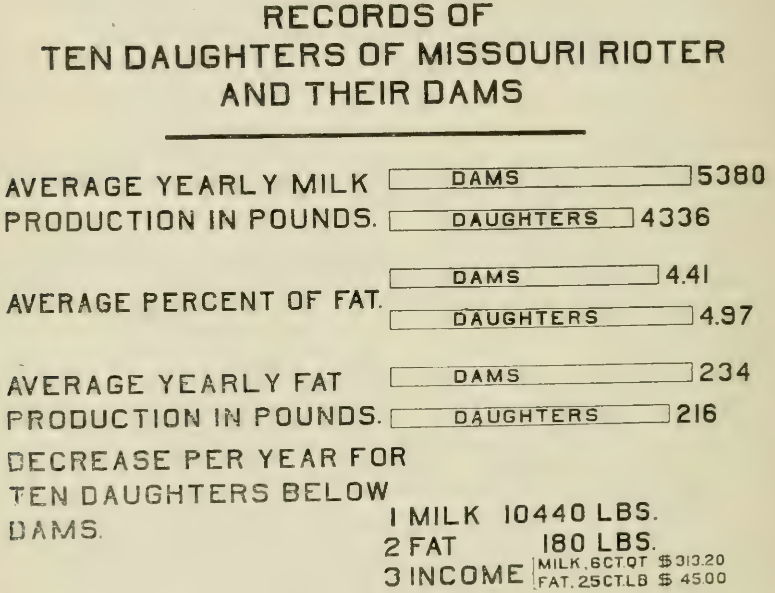
It has long been an axiom of the breeder that the sire is half the herd, and it is generally accepted as a fit expression of an important rule.

The skillful breeder of any kind of stock does not need to have it pointed out to him how important it is that the sire be properly selected. If he is a skillful breeder, it is largely because he realizes the importance of the sire and knows how to select him. While the skilled breeder realizes the importance of this breeding, the average dairyman does not give the question of the selection of the sire one-tenth the attention, the importance of the quetsion demands.

Thousands of men make use of a scrub or grade sire on account of mistaken economy in cost rather than pay a few dollars more for an animal that is almost certain to transmit desirable qualities. It is not surprising that we have so many worthless cows. They come by their worthlessness in the majority of the cases from sires worse than worthless. Some of these scrub bulls are registered in the herd books.

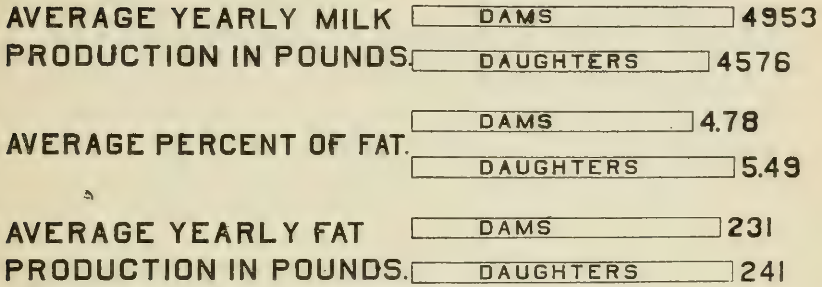
The most forcible means I have at hand to illustrate the remarkable difference in sires is to show some results from our own herd. In 1884 the Missouri Agricultural College bought four registered Jersey cows, and the entire herd we have on hand today is descended from these cows. Of course, herd bulls have been purchased from outside, but no female has been bought. Since 1892 complete milk and butter-fat records have been kept of every cow. Up until 1901 practically every female was retained in the herd regardless of her dairy qualities. These conditions give an opportunity to study the effect of sires which can hardly be duplicated anywhere.

The first bull used was Missouri Rioter, 19400, a son of Bachelor of St. Lambert. There is no record indicating the dairy quality of his dam. In fact, his sire is the only animal in his pedigree known to be a strong breeder. This bull was a very weak breeder, as is shown in the chart. His daughters averaged 4,336 pounds of milk per year while their dams averaged 5,380 pounds. A decline on the average of 1,044 pounds of milk per year each. The average yearly fat production of the dam was 234 pounds, while the daughters averaged only 216 pounds. A decline of 18 pounds per cow annually from the dams to the daughters.



The income from ten daughters, counting milk at six cents per quart, fell $313.20 per year behind the dams. Counting fat at 25 cents, the loss was $45.00. As long as this bull remained in the herd, it was going backward in production, instead of ahead. Suppose the herd had had thirty daughters of such a bull. Each year we would have been $135.00 behind what the dams produced, counting fat at 25 cents. If these cows were milked six years each, the total loss would be $820.00. This sum would buy several good bulls.

The next bull used in this herd was Hugorotus, 34447. This was a cheap bull without many tested animals in his pedigree. His mother, however, is said to have been a good cow. The daughters of this bull were inferior to their dams in milk production, but on account of higher per cent. of fat they gained slightly in fat production.



RECORDS OF
TEN DAUGHTERS OF HUGOROTOS
AND THEIR DAMS

DECREASE PER YEAR FOR TEN DAUGHTERS BELOW DAMS.

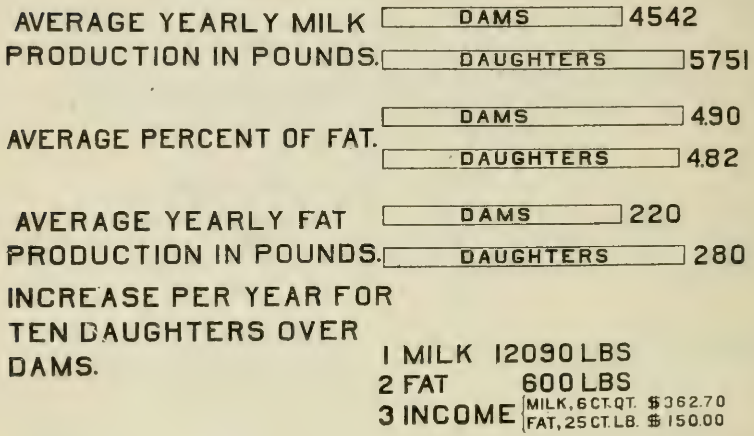
1 MILK 3770 LBS.
2 FAT (INCREASE) 100 LBS.
3 INCOME { MILK. 6CT.CT. $113.12
FAT. (INCREASE) 25CT.LB. $25.00

It will be seen in the chart that the ten daughters fell a total 3,770 pounds of milk per year behind their dams, but gained 100 pounds of fat. The general results of using this bull were disastrous. In fact, the poorest animals ever in the herd were his offspring. The averages shown are made as good as they are only by the fact that two full sisters sired by this bull, through some "nick," proved first class animals.

When this herd was culled on milk records alone, nine out of the eleven daughters of this bull then in the herd were sold to the butcher. The two remaining were the full sisters mentioned. As long as this bull was in the herd, the general tendency was backward.

The next bull at the head of the herd was Lorne of Meridale, 34024. This bull had a splendid pedigree from the standpoint of records, and his offspring show the results. His daughters, with one exception, were all superior to the dams.

RECORDS OF TEN DAUGHTERS OF LORNE OF MERIDALE AND THEIR DAMS



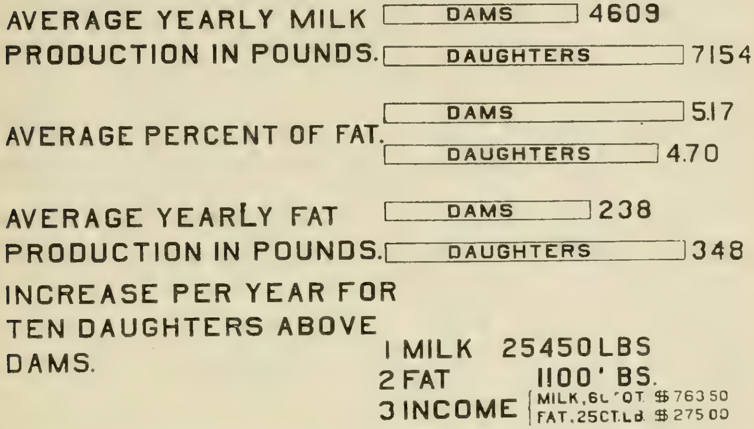
The chart shows that the average milk production was raised from 4,542 pounds per year to 5,751 pounds; the fat production from 220 to 280 pounds per year. At butter-fat prices the ten daughters of Lorne of Meridale returned each year $150.00 more than their dams. What a difference from the results from Missouri Rioter.

If we had milked thirty daughters of this bull six years each, their product would have exceeded their dams in value $2,700.00; while the daughters of Missouri Rioter went $939.00 behind, or a difference in thirty cows in six years of $4,639.00 in actual income.

What would be the value of Lorne of Meridale in a large herd, we cannot say, but I am convinced that as a business proposition an owner of a large herd could better pay $1,000.00 for him than accept Missouri Rioter as a gift. Yet, if he had been offered for sale when mature, the chances are that instead of bringing what he was worth, he would have brought little more than a bull beef price.

The next herd bull was Missouri Rioter 3rd, 34587. This bull was the son of Missouri Rioter, and was the only real good thing this latter sire left in the herd. The remarkable qualities of Missouri Rioter 3rd may come, in part, from his dam, which was the best cow in the herd up to that time, and, like the sire, the daughter of Bachelor of St. Lambert.

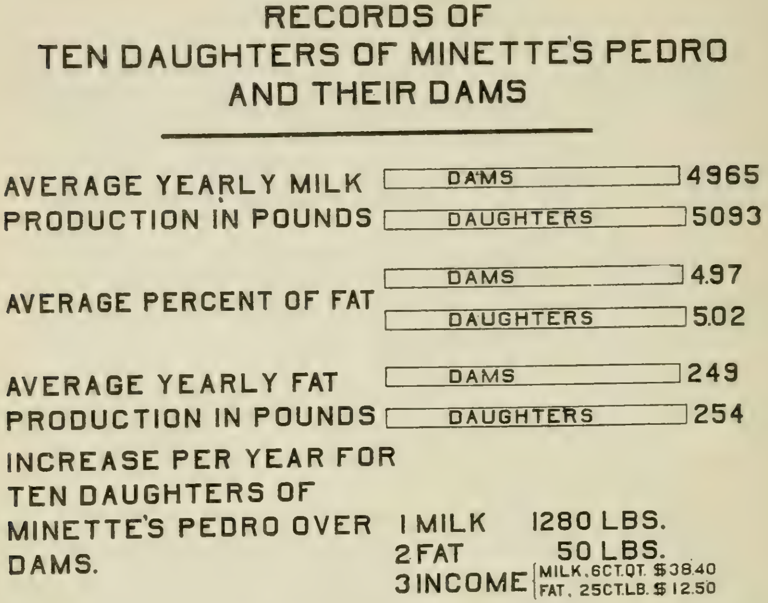
RECORDS OF TEN DAUGHTERS OF MISSOURI RIOTER 3RD AND THEIR DAMS.



The best cows ever in our herd were sired by Missouri Rioter 3rd. From dams with average records of 4,609 pounds of milk he sired daughters whose records average 7,154 pounds. The dams averaged 238 pounds of fat per year, and the daughters raised this to 348 pounds.

Ten daughters of this bull produced $275.00 worth of fat per year more than their dams. Counting this on the same basis as before, thirty cows for six years, we have $4,950.00 worth of butter-fat produced by the daughters in excess of that produced by the dams. What would be the value of this bull, had he been owned by an association of neighboring dairyman where he might have had one hundred daughters or more? This bull was raised on the College farm, and, as is often the case, because he was home product, instead of coming from a distant state, he was not counted of any special value, and was sold from the herd without any record even being made as to his purchaser, and he was never transferred. His remarkable breeding value was recognized when it was too late, and now we would like the chance of giving $1,000.00 to have him back.

Minette's Pedro, 50031, is the last herd bull with a sufficient number of daughters to give figures of any value. It may be observed that the herd remained practically at a standstill, while he was at its head. In general, this bull was not a very prepotent bull, since we have wide variations and a lack of uniformity in his offspring. Among them are some excellent cows and some worthless. From the good dams we secured good daughters; from inferior dams inferior quality of daughters.



These figures show the immense difference in the way dairy qualities are transmitted, even where all are pure-bred animals. The selection of a herd bull is a very serious matter for the man who is trying to build up his herd and the higher developed they are in the way of dairy production, the more serious is the problem.

One of the chief difficulties is that practically nothing can be predicted from the looks of the animal, if he has the inherent characteristics of transmitting good dairy qualities or not. Who will undertake to judge by the appearance of a bull, if he is one that will transmit dairy qualities as did Missouri Rioter 3rd, or whether he is as worthless as Hugorotus?

The man who will discover some means of so judging will confer a benefit on breeders that can scarcely be estimated.

There are two principles that are especially concerned with breeding, and should be kept in mind. The first is that "like produces like," and the second is the law of "natural variations."

The cow in the condition nature made her undoubtedly produced only milk enough to feed the calf for a few months until it could subsist on other feeds. This milking characteristic was transmitted quite regularly. It was a case where like generally produced like, but some cows, even then, were undoubtedly better milkers than others, due to the law of natural variation. The principle of selection did not come in to retain this variation, and no improvement in this characteristic was made.

After cattle were domesticated, the same conditions existed, but finally man began taking advantage of the natural variations and began saving breeding stock from those having the characteristics, such as greater milk production, which he found to be valuable.

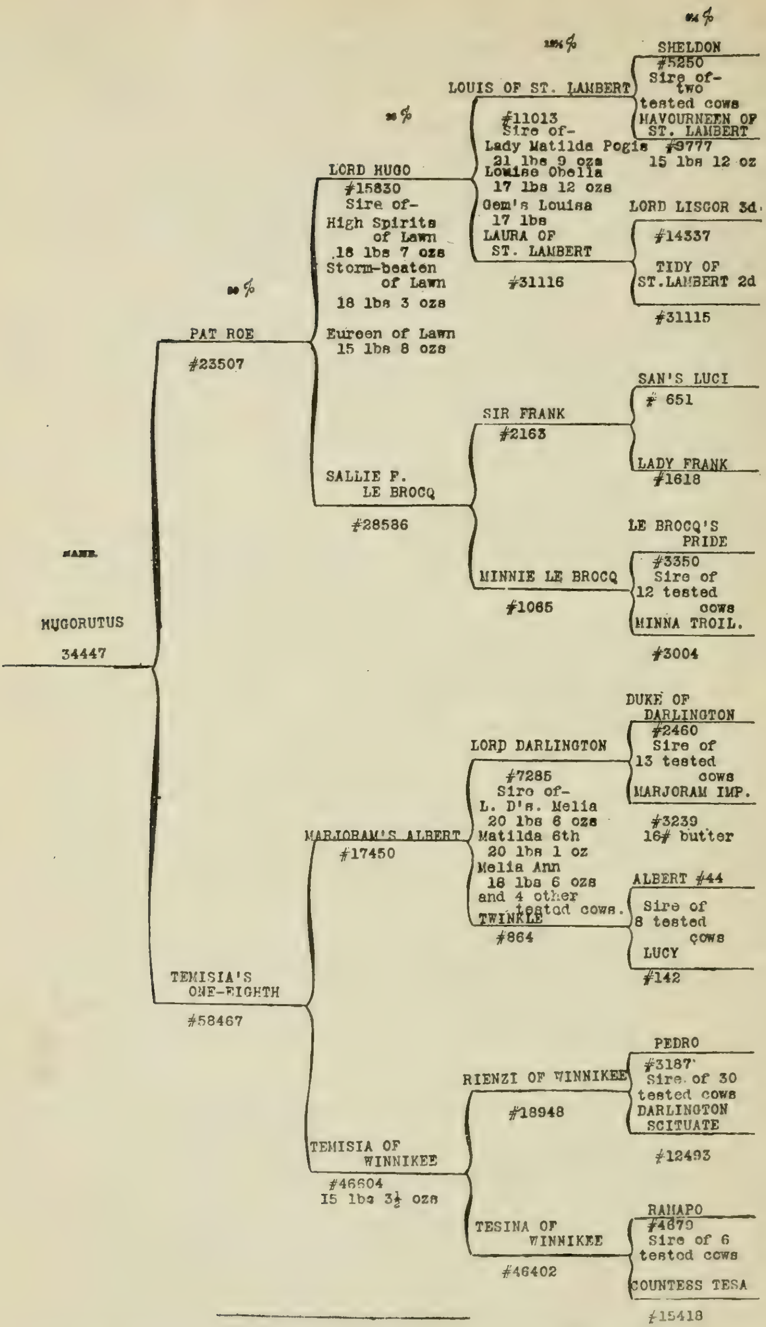
The animal which is different from the others of its kind by natural variation will reproduce this characteristic in a certain proportion of its descendents. If this same natural variation is in the ancestry of both parents, the chance of transmission is much greater, but under any circumstances only a part of the progeny will have the new characteristic.

The dairy cow of today is largely an artificial product, or, perhaps it would be better to say, she is an abnormality, since her mammary glands have been abnormally developed by taking advantage of the law of natural variation.

The rule of "like produces like" is only true to a limited extent, and the farther we get away from the original type in breeding the smaller the proportion of cases where it holds good. This accounts for the fact often observed that the offspring of a phenominal cow are often disappointing. However, it will be found that on the average there will be more good animals among the offspring of such a cow than among those from a cow of moderate, or low dairy capacity. We must always expect to find inferior animals appearing frequently in all herds. No breeder can prevent it, but no good breeder fails to reject the inferior ones promptly when discovered. The higher developed we get our cows, the more difficulty we must expect in keeping them all up to the standard.

In selecting a bull for a mixed herd, or one of low dairy capacity, any well-bred bull of a dairy breed with good producing individuals behind him is certain to benefit the herd. Even for the grade herd, the exceptional bull that will transmit qualities higher than the average of his breed is worth more than two or three inferior ones.

There are two courses open to the man selecting a herd bull: One is to buy a young bull on the strength of the records of his ancestors and trust to luck to a certain extent that he will be one that will transmit the desirable characteristics of his ancestors to a high degree. As a rule such a bull will do fairly well, at least in


HUGORUTUS
34447
PAT ROE
#23507
LORD HUGO
#15830
Sire of-
High Spirits of Lawn
18 lbs 7 ozs
Storm-beaten of Lawn
18 lbs 3 ozs
Eureen of Lawn
15 lbs 8 ozs
LOUIS OF ST. LAMBERT
#11013
Sire of-
Lady Matilda Pogis
21 lbs 9 ozs
Louise Obella
17 lbs 12 ozs
Gem's Louisa
17 lbs
LAURA OF ST. LAMBERT
#31116
SHELDON
#5250
Sire of-two tested cows
HAVOURNEEN OF ST. LAMBERT
#9777
15 lbs 12 oz
LORD LISGOR 3d
#14337
TIDY OF ST.LAMBERT 2d
#31115
SALLIE F. LE BROCQ
#28586
SIR FRANK
#2163
SAN'S LUCI
# 651
LADY FRANK
#1618
MINNIE LE BROCQ
#1065
LE BROCQ'S PRIDE
#3350
Sire of 12 tested cows
MINNA TROIL.
#3004
TEMISIA'S ONE-EIGHTH
#58467
MARJORAM'S ALBERT
#17450
LORD DARLINGTON
#7285
Sire of-
L. D's. Melia
20 lbs 6 ozs
Matilda 6th
20 lbs 1 oz
Melia Ann
18 lbs 6 ozs
and 4 other tested cows.
TWINKLE
#864
DUKE OF DARLINGTON
#2460
Sire of 13 tested cows
MARJORAM IMP.
#3239
16# butter
ALBERT #44
Sire of 8 tested cows
LUCY
#142
TEMISIA OF WINNIKEE
#46604
15 lbs 3½ ozs
RIENZI OF WINNIKEE
#18948
PEDRO
#3187
Sire of 30 tested cows
DARLINGTON SCITUATE
#12493
TESINA OF WINNIKEE
#46402
RAMAPO
#4679
Sire of 6 tested cows
COUNTESS TESA
#15418

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transmitting these characteristics. For the owner of grade cattle or herds of low dairy capacity, this method of selection does very well.

In selecting a young bull, the pedigree, including the record of ancestors, is of as much or more importance than the individuality of the animal. The things to be looked for in the pedigree are, first of all, records of production by the dam of the animal, if you are breeding for milk production. If you are breeding for show animals get a descendant of show animals.

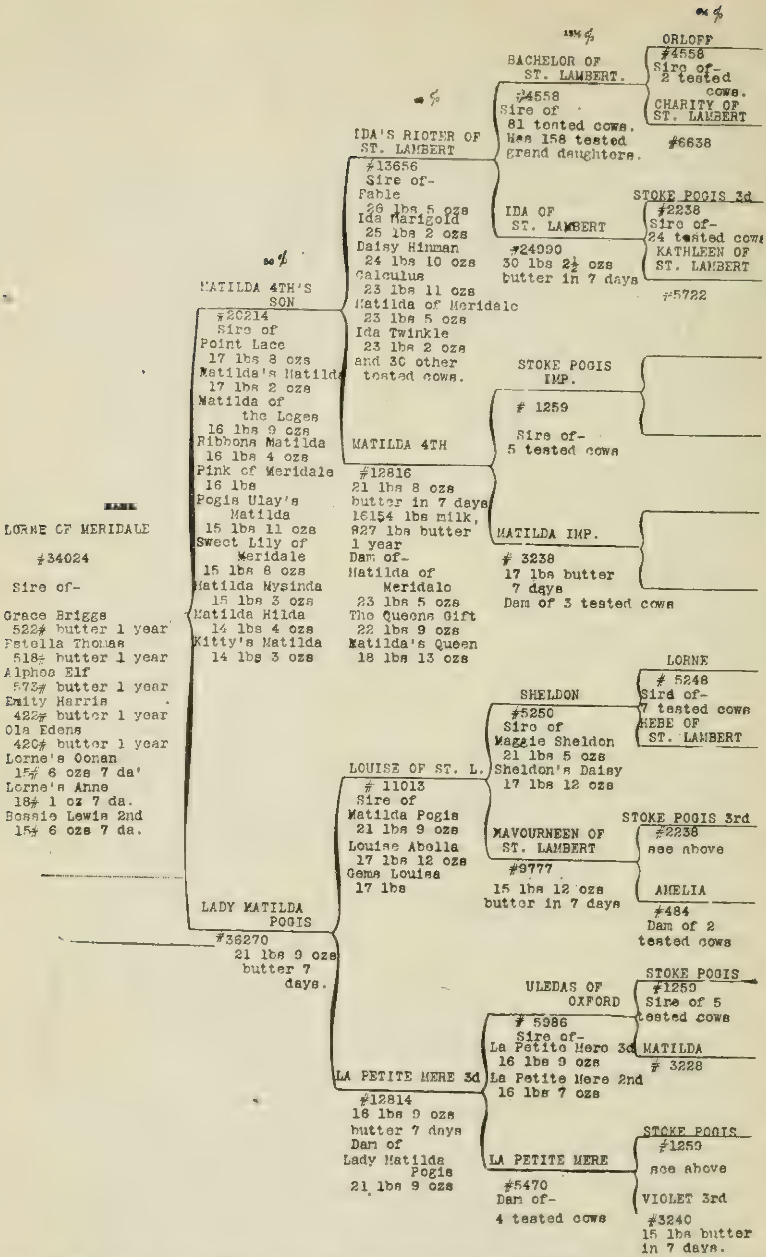
There are some who refuse to have a bull from the phenominal record-making cows for fear the vitality of the calf will be weakened. I belong to the large majority who want the dam to have the highest record possible, other things being equal. I do not expect more than a few of her close descendents will inherit this high quality, but the chances are better for them to average up well than they would be from a cow of lower productive capacity.

There is a general belief among breeders that the characteristics of the dam of the sire are transmitted stronger to his daughters than are the characteristics of any other single animal among the ancestors. How much there is in this belief, I am not prepared to say.

Next in importance to the dam's records comes the records of the sire's daughters. If the bull has sired many high testing daughters, it is a good evidence, but not certain, that his son will also transmit these characters. Third in importance comes the grand dams and son on through the pedigree. The pedigree of Lorne of Meridale is a good example of a pedigree strong in records, and having every indication a pedigree, can show that these characters will be transmitted as proved to be the case. The pedigree of Hugorotus shows only three tested cows, of which only one is as close as the third generation. The judgment that would be passed upon these two bulls from a study of their pedigrees would be the same as was the results in actual trial. It must not be expected, however, that the pedigree will always be as accurate an index of the value of the animal as it is in this case.

It should be kept in mind always that it is much more important to have a good animal for parent than a noted animal back in the third or fourth generation. I frequently hear men speak of having a Golden Lad, a Stoke Pogis, or a De Kol bull, and when you examine the pedigree, the animal mentioned is found in the third or fourth generation, which means they consider the most important fact about the bull to be the six and one-fourth of twelve and one-half per cent. of the blood of the noted bull he may carry. The close anscestors are the ones that count.

Care should be taken to discriminate between official records and private records of milk and butter production, especially where the latter are churn tests that test the ability of the butter-


LORNE OF MERIDALE
#34024
Sire of-
Grace Briggs
522# butter 1 year
Estella Thomas
518# butter 1 year
Alphea Elf
573# butter 1 year
Emily Harris
422# butter 1 year
Ola Edens
420# butter 1 year
Lorne's Oonan
15# 6 ozs 7 da'
Lorne's Anne
18# 1 oz 7 da.
Bessie Lewis 2nd
15# 6 ozs 7 da.
MATILDA 4TH'S SON
#20214
Sire of
Point Lace
17 lbs 8 ozs
Matilda's Matilda
17 lbs 2 ozs
Matilda of the Loges
16 lbs 9 ozs
Ribbons Matilda
16 lbs 4 ozs
Pink of Meridale
16 lbs
Pogis Ulay's Matilda
15 lbs 11 ozs
Sweet Lily of Meridale
15 lbs 8 ozs
Matilda Mysinda
15 lbs 3 ozs
Matilda Hilda
14 lbs 4 ozs
Kitty's Matilda
14 lbs 3 ozs
IDA'S RIOTER OF ST. LAMBERT
#13656
Sire of-
Fable
26 lbs 5 ozs
Ida Marigold
25 lbs 2 ozs
Daisy Hinman
24 lbs 10 ozs
Calculus
23 lbs 11 ozs
Matilda of Meridale
23 lbs 5 ozs
Ida Twinkle
23 lbs 2 ozs
and 30 other tested cows.
BACHELOR OF ST. LAMBERT.
#4558
Sire of
81 tested cows.
Has 158 tested grand daughters.
ORLOFF
#4558
Sire of-
2 tested cows.
CHARITY OF ST. LAMBERT
#6638
IDA OF ST. LAMBERT
#24990
30 lbs 2½ ozs
butter in 7 days
STOKE POGIS 3d
#2238
Sire of-
24 tested cows
KATHLEEN OF ST. LAMBERT
#5722
MATILDA 4TH
#12816
21 lbs 8 ozs
butter in 7 days
16154 lbs milk,
827 lbs butter
1 year
Dam of-
Matilda of Meridale
23 lbs 5 ozs
The Queens Gift
22 lbs 9 ozs
Matilda's Queen
18 lbs 13 ozs
STOKE POGIS IMP.
# 1259
Sire of-
5 tested cows
MATILDA IMP.
# 3238
17 lbs butter
7 days
Dam of 3 tested cows
LADY MATILDA POGIS
#36270
21 lbs 9 ozs
butter 7 days.
LOUISE OF ST. L.
# 11013
Sire of
Matilda Pogis
21 lbs 9 ozs
Louise Abella
17 lbs 12 ozs
Gems Louisa
17 lbs
SHELDON
#5250
Sire of
Maggie Sheldon
21 lbs 5 ozs
Sheldon's Daisy
17 lbs 12 ozs
LORNE
# 5248
Sire of-
7 tested cows
HEBE OF ST. LAMBERT
MAVOURNEEN OF ST. LAMBERT
#9777
15 lbs 12 ozs
butter in 7 days
STOKE POGIS 3rd
#2238
see above
AMELIA
#484
Dam of 2
tested cows
LA PETITE MERE 3d
#12814
16 lbs 9 ozs
butter 7 days
Dam of
Lady Matilda Pogis
21 lbs 9 ozs
ULEDAS OF OXFORD
# 5986
Sire of-
La Petite Mere 3d
16 lbs 9 ozs
La Petite Mere 2nd
16 lbs 7 ozs
STOKE POGIS
#1259
Sire of 5
tested cows
MATILDA
# 3228
LA PETITE MERE
#5470
Dam of-
4 tested cows
STOKE POGIS
#1259
see above
VIOLET 3rd
#3240
15 lbs butter
in 7 days.

maker as much as the butter production of the cow. An official record means what it says, and so do many private records, but there is always an element of uncertainty about the latter that detracts from their value.

Much more attention should be given to years records than to those covering seven days. Of course, there are other things to be taken into count in buying a young bull, but I believe the records of the ancestors are of first consideration. In buying a bull of any age, of course, we require an animal of good conformation, strong vitality and constitution and good breed characteristics. In buying a young bull, I want one from a cow medium too large for the breed. She must have been a regular breeder, and a cow of strong constitution and vitality. She must have a well-developed, symetrical udder and teats, and a large official year's milk and butter test.

While most dairymen favor the selection of a young bull as a herd bull, there always is the uncertainty about how he will transmit the dairy characteristics. There is a more certain but more difficult way to get a bull that will transmit the desired characteristics. This is to get an old tested bull, one who has sired daughters of merit, and showed himself to be the exceptional animal wanted by every breeder.

The most skilled breeders are always on the lookout for such an animal, but many are never discovered, and many others only after it is too late. Whenever possible, it is always advisable to retain an old bull until the results of his breeding can be ascertained. Then, if not satisfactory, the sooner he is gone, the better; but there is always a chance of finding a bull like Missouri Rioter 3rd, previously mentioned.

The wonderful prepotency of Stoke Pogis 3rd was not recognized until he had been sold for beef. Hengerveld De Kol, the great Holstein bull, that recently died, on the other hand, was retained until it was discovered he was one of the great bulls of the breed, and, as a result, was sold for $1,500.00 at nine years of age for breeding purposes.

One of the great unnecessary losses among dairymen is the sacrifice of the bulls when they are mature and at their best. The average dairyman buys a young bull, uses him two or three years, and offers him for sale without waiting to learn of the quality of his daughters. His neighbor, instead of buying the old bull, buys a young one, and the older one that may be worth a fortune to the community is sold for beef, while the neighbor is experimenting with the young one.

There is one danger connected with the aged bull that should be understood and guarded against. This is the introduction of contagious abortion. If I had a valuable herd free from this disease, I would exert the greatest precaution about introducing an aged bull. If I was not entirely satisfied on this point, I would select the young calf which is safe from abortion, even if coming from a herd where the disease exists.

THE WORK OF THE U. S. DAIRY DIVISION IN THE SOUTH.

(By B. H. Rawl, Washington, D. C.)

Mr. President, Ladies and Gentlemen—In discussing the work that is being done in the south by the Dairy Division, it is desirable that some of the general policies of this division be first explained. One of the most important of these is, that the Dairy Division should take up lines of work not being carried on by other institutions. There are many of these, and some of them effect the dairy industry in all parts of the United States.

Another policy of the Dairy Division is to encourage co-operation. The problems to be solved in the development of this great industry are so great and so numerous that concerted action on the part of all workers is absolutely essential to the best interests of the industry. For example, the average cow in the United States produces 139 pounds of butter fat per annum. It is but a question of applying the information that we now have, and the average cow in the United States will produce 300 pounds of butter fat per annum. Here is a problem that alone means to the American dairymen not less than $600,000,000.00 per annum. If every man in the United States who is working in the development of the dairy industry were to give his entire time to this problem, a hundred times that number of men could be used economically in solving it. This is but one of many such problems.

The Dairy Division recognizes the fact that in order for the dairy industry to grow rapidly, strong local support must be given it in every section. Every state must have a good dairy school, an enthusiastic dairy association, and other like institutions, whose officials will search into every economic problem the solution of which is necessary to the progress of this great industry. Hence it is the policy of the Dairy Division to conduct those lines of work that will most stimulate and assist the local institutions in their development. I cannot too strongly emphasize the importance of this policy the results of which must necessarily be thoroughly substantial and far-reaching.

With the above policies in mind, the first work of the present chief of the Dairy Division on assuming the duties of his office in January, 1905, was to look over the field to see what lines of work should be taken up first. In the southern states there is but a limited dairy industry, yet the south needs dairying because it is not only profitable there, but will contribute very largely to the development of general agriculture. It is unnecessary, though, for me to discuss this point to an audience of Missouri dairymen.

It was, therefore, considered feasible to conduct a line of work throughout this entire section, supported by all the agricultural colleges, experiment stations and the United States Department of Agriculture, which would carry information to a dozen or so dairy farms in each state, which information when applied under the existing conditions at these several farms would make them entirely successful. These farms would then become object lessons, and would exert a great influence for dairying in the surrounding communities. This influence would grow and in time become so great as to enable these local institutions to continue the work independently. When such a condition is obtained the assistance of the Department of Agriculture should cease. It was not the intention that experimental work should be excluded, because there are many dairy problems in that section, as in all sections, that are still unsolved, and whenever assistance could be given in working out these problems it should be done, still the first purpose of the work is to apply the information that is now available. This plan of work was adopted, and was the first new line taken up by the Dairy Division under its present executive.

Let us now note briefly some of the details of the work, and some of the results that have been produced. The first consideration in beginning this work in a state is to determine whether or not some local institution, such as the agricultural college, experiment station or State Department of Agriculture, will take an active part in it. If none are willing to do so, nothing is done in that State. So far, such a case has not occurred, for all of the state institutions are anxious for the work to be done and heartily cooperate in it. The Dairy Division furnishes one man to do field work in each state. The agricultural college, experimental station or State Department of Agriculture, as the case may be, provides an office for this man, and when possible some additional help for the field. The work then is jointly planned by the Dairy Division and the state institution, and the field man is instructed to execute the plan adopted. All reports of the field man are duplicated; one copy being sent to the office of the Dairy Division and the other to the state institution, and neither publishes the results without the consent of the other.

It is necessary that the field man become familiar with the conditions prevalent in the state in which he is to work, hence the first thing he does is to make a tour of the state, visiting as many of the dairymen as possible, and particularly the leading ones. On this trip he makes a close study, not only of the methods employed, but of the dairymen themselves, as it will be necessary later for him to select some eight or ten of them with whom to cooperate. Energetic young men who are inclined to improve their work are preferable. It is unnecessary for a man to have a large herd of cattle for our work, and we prefer to work with the small herd if the owner is all right. It does not matter even if the barn is crude and the equipment meagre if the owner is a man who will think for himself, and will apply a lesson when once it is learned. The selection of the men with whom to work is so very important that upon it depends, in a large measure, the success or failure of the work. No specific agreement with the dairyman is necessary, since the assistance he receives is absolutely free. It is impossible to be certain about the selection of a man until he has been tried in the work, hence it sometimes happens that after the field man has worked for a month or so with a dairyman he finds that his work is going to be entirely useless, hence the man is discontinued at once. In beginning work with a dairyman the field man studies very carefully the surrounding conditions, how the product is handled and sold, how the cattle are fed, the quality of the cattle, etc. He then shows the dairyman where there are possibilities of losses and endeavors to get him to do such things that show up the losses if they exist. For example, the average dairy cow in the southern states produces about 123 pounds of butter fat per annum, and a good dairy cow in that section as in all other, produces 300 pounds or more. Thus in the majority of cases it is found that some of the cows in the herd are very inferior. The field man might recognize this at a glance, but that doesn't amount to anything since before the inferior cow can be removed, the owner must be convinced that they are inferior, and methods suited to that end must therefore be adopted.

Our plan is this: We show him the difference in the profit of a good cow and a poor one, make the calculation, if necessary, showing that a good cow will make a profit of $50.00 per annum, while a poor one will not pay for her feed. Then we ask him if he knows to what extent these two kinds of cows are present in his herd. If we succeed in getting his interest, we offer to provide him with milk and feed record blanks, and to lend him milk scales for a time, that he may determine what each animal in his herd is producing. If he will promise to make the records for a month, we promise to return to his place at the end of the month and to test the herd and help him to figure up just what each cow has made or lost. When we make our second visit we try to find out, not only what each cow in the herd is producing, but how much product was sold for the month, what price was received for it, and what the entire dairy is making or losing. It often happens where farm dairy butter is made, that a large per cent of butter fat is being lost in churning, or that a bad quality of butter is being made, and hence it brings a low price. Our purpose for the first month is to find out just what the dairy is doing before any assistance is given.

But let me tell you something more about the first test made of the herd. It is human nature for us to see the faults of others sooner than of ourselves. The dairyman perhaps reads some of the dairy papers, and sees the startling results of herd testing in various parts of the country; he perhaps goes to the farmers' institute and hears a discussion on the subject which shows what it will do for the dairyman, and he decides, too, that perhaps it is a pretty good thing for the *fellow who needs it,* but some how it never occurs to him that *he is that fellow.* His herd is as good as any in that section, for possibly there is none other in that section. But if we can get him to weigh his milk and keep track of the feed used for one month, when we go back and test the herd and figure up just what each animal has made or lost, he is going to see the whole situation in a new light. We then have him at a place where there is no *"other fellow,"* for the results are made by his own cows, on his own place, and even the figures are his own. He is shown where this cow made a loss of two dollars for the month, that one a loss of three dollars, and still another made a profit of five dollars. He sees that these three cows just broke even for the month, one made a profit of five dollars and the other two lost five dollars. Any man now can clearly see whether it is better to keep all three, or just the good one, and that is just exactly what we are trying to make him see. If there is anything at all in a man, when once he learns this lesson he will never again allow his herd to drift along from year to year without knowing what each cow in it is doing.

If the test confirms our judgment that some of the cows are unfit to be retained in the herd, we urge that they be disposed of as soon as possible, and for any price that they will bring. Others that make no profit that particular month should be given a chance, as conditions may have been against them. If the dairyman shows sufficient interest we then ask him to continue the work of keeping records, and promise to return to his place about once a month and help him to test his herd and figure out just what the business is doing. We find it a bad policy to try to get him to do too many things at once. When we start on one line like herd testing we do not bother much about other things, until we get results in this line. When he finds that a half or two-thirds of his herd will make more profit than all of it originally made, his confidence in our work increases so that when we decide that he should have a silo (which is done as soon as conditions will warrant it) he is willing to put it up. Later on when other improvements are suggested he is glad to make them, for now he is beginning to realize that he is getting into a new business. His dairy is becoming profitable and he is becoming more and more interested in every detail of the work. He has bought a pure bred bull and anxiously waits for his first heifers from the best cows to come in, to see whether or not they are going to be better than their dams. The old filthy barn yards have been cleaned up. The barn now has a good floor and glass windows, a silo stands nearby, the cows are well fed and clean, the manure is put directly upon the fields or is put under a dry shed instead of being piled up against the side of the barn where it was thrown out of a hole in the wall, the fields are becoming more and more productive, the dwelling has been painted, and there is no subject that is discussed around the fireside of the home quite as frequently or with quite so much interest as the dairy. While at one of the farms a short while ago, where this work has been in progress for something over a year, the wife of the owner joined us when we went to see the new dairy house which had just been completed, and when we got down into the pasture she seemed to known as much about the records of the cows as her husband. The greatest interest was shown in the work of the herd, and as each cow that was to be disposed of because of low production was pointed out, this remark was made "She goes to the Shambles." All this is due to the fact that the dairy has become profitable, and it has become profitable because of the application of dairy knowledge.

One herd of 22 cows that was hardly paying expenses when this work began, made a clear profit last year of $805.32, or an average of $67.00 per month. Practically all the cows that were originally in the herd had been sold and others purchased.

Another herd of fourteen cows that was making $1.80 profit per cow per month when the work began, was making a profit of $4.19 per cow per month ten months later.

Another herd of eight cows that was making a loss of 6 cents per cow per month when the work began, was making a profit of $5.22 per cow per month one year later.

Another herd of seventeen cows that was making a profit of 59 cents per cow per month when the work began, was making a profit of $2.31 per cow per month one year later.

Many such results have been produced and some of them are phenominal. Notwithstanding this, however, we have some failures, for some men absolutely refuse to carry on this work as I have outlined it. We expect a certain number of failures, though, and when we find that we cannot reach one man we drop him and hurry to another. At the present time we are carrying on this work at more than one hundred farms, and we are testing monthly between 2,500 and 3,000 cows. We have also assisted in building 56 silos, and 26 dairy barns, besides the assistance given in repairing many barns and correcting many smaller difficulties. We give assistance in building barns and silos by furnishing plans and bills of quantities, and by visiting the place and helping to begin the building. Particularly in the case of silos, our men always arrange to be present when the silo is begun and stay until it is far enough along that no serious mistake is possible.

There has been produced sufficient results to show conclusively that dairying has a good future in the southern states, and all that is needed to build up the industry is the application of dairy knowledge. But do not some of the lessons that have been mentioned, need to be learned and applied by some of your Missouri dairymen? Perhaps not by you who are present at this fine convention, for your presence here indicates that you are studying and applying these lessons. But there are hundreds of dairymen in your state who are but little more than paying expenses with their herds. They can't be induced to come to such meetings, but your work and your success at home will in time reach them, for the average man will follow new methods only when he sees the results of them. Through you and through you alone, then, can these people be taught better methods, the application of which will double and quadruple their earnings. This convention is the very heart of the dairy industry of Missouri, so let us remember that in carrving these truths to our different communities, we are carrying to them prosperity and happiness.

BETTER THINGS FOR THE DAIRYMAN.

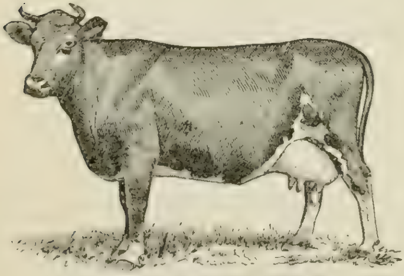
(By Prof. W. J. Fraser, Illinois Agricultural College.)

MULTITUDE OF WORTHLESS COWS MUST GO TO THE BUTCHER—HOW TO SECURE THE GOOD ONES THAT MAKE LARGE RETURNS.

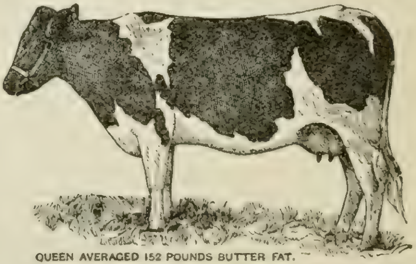
The actual relation of the cow and the herd to the *real* profits derived from dairy farming is little realized by the people depending upon this occupation for a living. There is no line of farming where *well-directed* effort will pay so large a profit. Remember I say *well-directed* effort, for the profits derived from dairy farming depend almost entirely upon the good judgment and common sense used. The profits on the average dairy farm today can easily be doubled.

THE COW IS THE MARKET.

A dairyman considers his market the place where he disposes of his milk, cream or butter, and in one sense this is true, but the place he markets the products of his farm as the grain, hay and silage is the dairy cow. The efficiency of the cow consuming these must therefore bear a vital relation to the dairyman's profits. If in a town having two grain elevators, one paid one-half cent bushel more for grain than the other, no farmer would be foolish enough to sell his grain at the one paying the lower price. Yet draiymen will persist in keeping cows year after year that are paying them only twenty-five cents a bushel for grain, while others in the same herd, or that can easily be obtained at a reasonable price, will pay fifty cents a bushel, or even more, for the grain they consume. The difference in price which individual cows are paying for their grain is not so apparent as the difference at the elevators, but it is none the less actual and affects the pocket book just as surely in the end.



ROSE AVERAGED 384 POUNDS BUTTER FAT.
ROSE RETURNS $5600 PER YEAR PROFIT.



QUEEN AVERAGED 152 POUNDS BUTTER FAT.
QUEEN LACKS $200 OF PAYING HER BOARD AND LODGING.

WHAT ROSE HATH WROUGHT.

Fifty-Seven Weeks of Advanced Registry Record.

Twelve pounds of butter fat for a single week is the production required for admission to the Holstein-Friesian advanced register. Twenty different weeks in her third lactation period, Rose made more than 12 pounds per week. Three times in this period she made 17⅔ pounds of butter fat per week. For five successive weeks, six months after calving, her average was 13 pounds of butter fat per week. In her fourth lactation period, there were 16 weeks during each of which Rose made more than 12 pounds of butter fat; and in her fifth lactation period, 21 weeks.

Total production for 12 years, 87,102.3 pounds of milk—43½ tons—10,248 gallons—1,281 cans of 8 gallons each—106 wagon loads of 12 cans each; allowing three rods for a team, this would make a procession one mile long—6 car loads, making a good milk train.

Butter for 12 years, 4,318.36 pounds, worth at present prices (25 cents per pound), $1,079.59.

Skim milk for 12 years, 72,585 pounds, worth at 15 cents per 100 pounds, $108.88.

Total receipts for 12 years (not reckoning calves nor manure), $1,188.47, or $99.04 per year.

Just think what the receipts of a dairyman would be whose herd consisted of 25 cows of this kind—$2,500 per year, not counting calves and manure.

Rose was bought for $50 when 4 years old. She has had only ordinary treatment, no better than she would receive on a good dairy farm. She has not been pampered or fed to produce the utmost she was capable of making.

Remarkable as is the performance of this grade cow, she is not heralded as standing apart in unapproachable splendor, but as a great leader of the thousands of money-making cows in our dairy herds.

In striking contrast to Rose and the class of cows she represents, is Queen. With equally good feed and care, Queen's average production for seven years was only 4,414 pounds of milk and 156 pounds of butter fat.

Cows No. 1 and No. 3 were purchased from a large herd and taken to the University. They were fed and cared for in the same manner, and their average production for three years was: No. 1, 11,390 pounds milk and 404 pounds fat; No. 3, 3,830 pounds milk and 138 pounds fat.

From the testing of over 1,000 cows in the dairy herds of Illinois, it has been proven that this great difference in cows extends to practically every herd in the state.

Illinois has a million dairy cows. Like men, they do not all travel the same path nor reach the same destination. Whither are they going, and how far, in their service for the dairyman? Who has stopped to ask, much less to answer, the question? What difference is there in their efficiency? In the profits they leave in the owner's pocket at the close of the year? The dairyman has been in the dark as to the paths his cows take. But under the arc light of the scales and Babcock test the parting of the ways is made plain. Half of all the cows in Illinois take the one or the other of the above paths.

Extensive investigations by the Illinois Experiment Station indicate that a fourth of all the cows in this state follow the left-hand path. That is, they produce no more than the average of 133½ pounds butter fat per year. That is the average of the lowest fourth of 554 cows in 36 Illinois herds tested a full year by this station. This path is not the "milky way;" it lacks the upward arch, the starry brightness—and the milk.

At 23 cents a pound for butter fat, these 139 cows make a return of $30.77 to the dairyman. At $30 per year for feed—and who would figure it less—their profit is 77 cents per cow per year. It takes one of these cows four and one-half days to earn one cent profit, or the fun of milking her 45 times to earn the enormous sum of 5 cents.

But the highest fourth of the 554 cows produce 301 pounds butter fat, which means an income of $69.32 and a clear profit of $31.32 per cow (after taking out $38 for feed). These are the cows taking the right-hand path above. These are certainly the right cows, and the path they take leads right on to the right things for the dairyman—profit, progress, plenty, an attractive home, wider usefulness, higher education for his children, and real enjoyment of country life for all the family. And the right dairyman will take great pains to add this kind of cows to his herd.

The average cow in that right-hand path is worth as much in actual profit to the dairyman as 40⅔ cows in the left-hand path;

and 25 cows of this better sort return as much profit as 1,021 cows that turn to the left.

As seen above, the poor cows naturally find their way to a poor barn, a poor home, a poorly kept farm and a poor dairyman—and in the end, the dairyman will do well, after slaving hard for years, if he does not find his way "over the hills to the poor house." If all these things are not met with on that cow path, it will be no fault of the great bovine procession traveling that way.

Not only individual cows but large portions of herds, and even whole herds, take the wrong path at the parting of the ways. Of these 36 herds, all the cows of the poorest three herds averaged a profit of but $1.74 per cow per year. The average cow of the best herd is worth more than 24 cows of the kind that forms the poorest three herds. The writer knows three other dairy herds, the milk returns of which show a profit of but 62 cents per cow for the year. While in the same neighborhood are three herds, the milk of which averaged a profit of $60.94 per cow. One cow of this kind equals 96 cows of the other three herds. And in another locality the same kind of a contrast came to the writer's attention.

A little pondering of these divergent cow paths may help the dairyman to make a good turn for himself—turn on the light of the scales and test—turn off the poor cows to the butcher—and turn all his attention to the high-producing cows that make a specialty of turning feed into milk and money. It all depends on which path the cows take—and which cows the dairyman takes.

SPECIFICATIONS AND SPECULATIONS.

Twenty-five cows of the better kind would return the dairyman a clear profit of $783 per year. They could be kept on an 80-acre farm; they would require only a barn 32x45 feet and a 100-ton silo, and the cows themselves at $70 per head would cost only $1,750—a very good little business.

But the dairyman could make just as much money (and no more) from the 1,021 cows of the other kind. However, the investment would be somewhat different and here are some of the details for the benefit of anyone who might prefer to handle the 1,021 cows to make $783, as in effect, many of the Illinois dairymen are now doing with at least a portion of the herd.

To stock up for full business the first year, Mr. Dairyman puts $40,000 to $50,000 in his pocket and goes to market. It will require only two trains of thirty cars each to bring home the 1,021 cows. Walking as closely together as possible, single file (each cow occupying but eight feet in the line) they will string out more than a mile and a half in driving up from the station. It will take the biggest part of an hour for them to pass through the gate at a steady walk. Standing as closely together as they can be crowded, they would fill 2½ acres of yard, but a five-acre yard would be too small to accommodate them properly. A barn thirty-two feet wide for two rows of cows, and with stalls three feet three inches wide, would have to be 103 rods long to house this herd. It would extend nearly around the four sides of a five-acre lot and would cost a matter of $40,000—but it would save fencing. If the cows were to run loose in a covered barn lot, three acres would have to be covered. Eighty-five good milkers could handle this herd easily. Fifteen hundred acres of pasture ought to be plenty for grazing. To feed these cows a ton and a quarter of hay per cow would require a rick twelve feet wide and twelve feet high and nearly a mile long, or almost three times around the five-acre lot—providing a great wind-break. Eight hundred acres of meadow should produce this hay. Forty 100-ton silos would be sufficient.

One would certainly realize that he was in "big business" driving up these 1,021 cows and milking them on a sweltering night in fly-time—yet this is the size of the "business" as to profit that one-fourth of the 1,000,000 cows in Illinois are doing today.

All this to equal twenty-five really good cows and get $783 profit! This herd could be very well managed on a 3,000-acre farm of good land. A dairyman having a bank account of $100,000 or so could keep these cows, but they would be a bit dangerous for the common dairyman to handle. But he is handling them in smaller numbers and doesn't see the danger, because their worthlessness is hid behind the high production of the good cows in the herd.

Many dairymen of Illinois have accommodations for 80 cows. To equal that number of good cows, averaging 301 pounds of butter fat, would require a herd of 3,266 cows and accommodations about three times as large as here indicated.

The profitless cow is a real and living issue and a large one in dairying for bread and butter. One of the greatest and easiest steps of improvement in the dairy business today is to discover and weed out these poor cows. Isn't it time to stop guessing at these vital elements in the profit of the dairy business and to find out for sure—by weighing and testing the milk—what each individual cow is earning for the owner.

We all know there is a difference in dairy herds as well as in individual cows. But do we clearly understand that some herds do not pay for the feed given them? That other herds pay too small a margin of profit to justify the investment in money and labor? And that still other herds are making their owners big money? When we realize this, it is easy to see how the profit can be doubled. Do dairymen in general know that these differences rest on plain causes that may be readily understood, and that a change from the poor herd to the highly profitable herd is a comparatively easy matter, within the reach of any farmer who is able to keep cows at all?

Ten years of observation of Illinois dairy herds and the individual testing of more than 1,000 cows in fifty herds, has given the speaker positive evidence of the practical worthlessness of about one-fourth the cows in these herds and the exceedingly great efficiency and value of the best one-fourth. Both these classes of cows are common in every community, and as a rule there are some of each in every herd.

NO ACCOUNTS KEPT.

It is equally surprising that these poor cows are not known to the owner; their demand on his charity is not suspected. It is very hard to find a dairyman who employs any means whatever of knowing the exact returns from each cow in his herd. The ordinary dairyman has no idea of how much milk, butter fat or butter each animal produces in a year, or how much it costs to feed her. The natural result with the majority of our dairy farmers is large investment of money and labor for too small returns.

Few, if any, herds we have tested contained no cows of lowest fourth that produce only 133 pounds fat. Nearly every herd also has some good cows producing over 300 pounds fat. Have a profitable standard and raise this each year, selling all cows that fall below this standard. This is easily done, and it requires much less energy to weed out the poor cows than it does to continue to milk them.

Such records as we have discussed indicate that one-fourth of all the dairy cows in the state may be placed with Rose in the same general class of high-producers. This is made still more emphatic by the contrast of the poorest one-fourth of the same 554 cows, yielding an average of only 133½ pounds butter fat.

THE MISSION OF ROSE.

The 12-year record of Rose and her pioneer identification with these discoveries (all made by weighing and testing the milk of individual cows throughout the year) have given Rose a distinct mission to dairymen everywhere— a mission of far more value than the tons of milk she gave and the dollars she returned her owner. And this is her message: "In almost every dairy herd are several very good and several very poor cows, but the dairyman doesn't know how good or how poor they are. The difference is surprising and vital to the dairy business. It is the difference between success and failure—between poverty and plenty. Find out what each cow is doing—or isn't doing—(by weighing and testing her milk). Keep the good cows and keep no others."

Let the memory and record of Rose ever stand, first, for a definite knowledge of this difference in production, and second, for a settled policy of improvement of the herd. Standing for this, Rose will yet save the dairymen who are milking the million cows of Illinois 4,000 times $1,200 in twelve years.

WHOLE HERD BROUGHT UP TO 307 POUNDS.
BUTTER FAT PER COW BY TESTING AND WEEDING OUT POOR COWS.

No. of cow.	1904.			1905.			1906.		
	Milk, lb.	Fat, per cent.	Fat, lb.	Milk, lb.	Fat, per cent.	Fat, lb.	Milk, lb.	Fat, per cent.	Fat, lb
1	5,970	4.55	272	....	......	......	....	......	......
2	8,579	3.19	274	8,062	3.2	262	10,201	3.55	363
3	4,818	4.27	206	....	......	......	....	......	......
4	3,212	4.7	151	6,663	3.9	258	6,895	3.88	269
5	6,360	3.72	237	6,196	3.5	218	....	......	......
6	9,802	3.94	386	8,607	3.9	339	7,674	4.83	371
7	4,701	3.67	176	....	......	......	....	......	......
8	6,992	3.41	239	....	......	......	....	......	......
9	4,408	3.79	167	6,442	3.4	220	9,367	3.6	338
10	5,368	4.05	218	6,634	3.6	236	8,313	3.55	296
11	4,498	4.35	196	7,819	4.0	316	5,943	4.22	251
12	6,823	3.71	254	5,834	4.2	244	8,202	3.83	314
13	3,773	4.47	167	4,356	4.2	182	....	......	......
14	5,890	3.26	192	7,731	3.1	238	8,211	3.21	264
15	....	......	......	7,263	4.1	298	7,493	4.17	313
16	....	......	......	9,660	3.28	317	12,999	330	439
17	....	......	......	....	......	......	7,889	3.83	303
18	....	......	......	....	......	......	6,669	4.15	277
19	....	......	......	....	......	......	8,607	3.31	295
20	....	......	......	....	......	......	4,342	4.8	*209
Totals	81,194	......	3,135	85,267	......	3,128	112,804	......	4,302
Average per cow	5,800	3.86	224	7,105	3.66	260	8,057	3.81	307

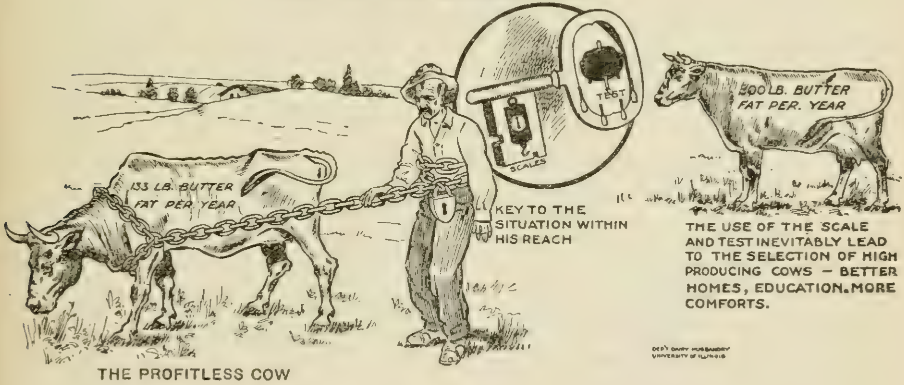
*For 11 months.

GAIN OF 83 POUNDS BUTTER FAT PER COW IN TWO YEARS.

These figures furnish a very interesting study. It is seen that the 14 cows the first year averaged, 5,800 pounds of milk containing 224 pounds of butter fat; that the 12 cows the second year averaged 7,105 pounds of milk with 260 pounds of butter fat; and that the 14 cows the third year (1906) averaged 8,057 pounds of milk and 307 pounds of butter fat per cow.

The greatest fact apparent at first sight is an average gain of 36 pounds of butter fat per cow the second year, and another gain of 47 pounds of butter fat per cow the third year—a total gain of 83 pounds per cow for the two years. This means a gain of 97 pounds of butter per cow in the year's production, which at the average price he has received amounts to about $24.25. This gain is much more than the whole profit from the average dairy cow in Illinois. The above increase is known from an accurate record of the weight and test of the milk for a week at a time every nine weeks throughout the year.

TIED TO THE WRONG COW


133 LB. BUTTER FAT PER YEAR
TEST
SCALES
300 LB. BUTTER FAT PER. YEAR
KEY TO THE SITUATION WITHIN HIS REACH
THE USE OF THE SCALE AND TEST INEVITABLY LEAD TO THE SELECTION OF HIGH PRODUCING COWS — BETTER HOMES, EDUCATION. MORE COMFORTS.
DEP'T DAIRY HUSBANDRY UNIVERSITY OF ILLINOIS
THE PROFITLESS COW

Americans don't take kindly to the idea of chains and slavery, but many a dairyman has unconsciously drifted into the condition of the man in the picture. He is not chained to a fellow-prisoner or to a post, but to a common (altogether too common) brute—to a worthless, willful cow.

He doesn't know where he is going; he simply follows the cow. That's how he got tied up to this creature; he didn't know what he was doing, nor what the cow was doing—or rather what she wasn't doing. In fact, there's been altogether too little looking and doing in this man's business. The dairyman has blindly followed without figuring; he has worked hard with his hands but little with his lead pencil, and the dollars have come his way very reluctantly. And as for the cow, the only thing she has done right well—is the dairyman; she is "doing" him beautifully. If the dairyman ever gets hold of that big key there'll be "something doing" in that dairy! He will soon hand over his end of the chain to the butcher.

But do not mistake this cow for a rare specimen of an almost extinct family. On the contrary, she is very common and popular on all our prairies. When it comes to remorseless stealing of the bread from the mouths of the dairyman's family, her tribe may well be classed with the great business sharks that prey upon the people.

The dairyman, who says that dairying doesen't pay, is ten to one boarding several cows of this kind in his herd.

The dairyman is not exactly easy in his mind. That chain is heavy and tight, but he has carried it so long that he thinks that burdens belong with dairying, or he lays the blame to ill luck or a poor price for milk; or perchance he says he cannot afford to keep good cows, forgetting that he could less afford to keep poor or worthless ones.

But see, the hands of science and the most successful dairy experience have provided him a key to the situation. As soon as ever he sees it—Oh, that he might see!—he will make use of the scales and Babcock test and find out what every cow on the place is doing for him—or against him. Armed with that knowledge, he will never follow that pious old fraud of a spendthrift cow again.

The cow for this dairyman stands behind him. She has learned the knack of turning feed into milk and butter fat. She represents the average production of the best fourth of the dairy cows (300 pounds of butter fat per year), and the dairyman should get better acquainted with her. She is a better cow than he thought. In fact, he has not thought enough about this cow or known how many such cows are in his herd. He cannot know without using the key—weighing and testing the milk of each cow for the year. He would have a vastly easier time of it if he were tied to this cow, and to this cow alone. And as sure as he uses the scales and test and comes to know each cow's production, he, like all other dairymen who have tried it, will gradually change his herd to this kind of high producers. And that will inevitably lead to more profit in his business—to better education for his family, to a more comfortable home, and to the conveniences and privileges that go with real prosperity.

The faults and failings of the worthless cow have cancelled or concealed the profits of the good cow, just as human idlers are a tax upon their fellows. The good cow has to do the work for both. Not knowing the production of either, the dairyman has over-estimated the poor and under-estimated the good. One cow of the good kind, producing 300 pounds of butter fat per year, is actually worth to the dairyman more than forty cows of the other kind. When the dairyman knows the good cows in his herd—knows how good they are—he will be just as anxious to tie to them as they are willing and faithful to serve him.

When will the dairyman start the rebellion (and the test), throw off his fetters, and fill his barn with the kind of cows that are glad to earn him big money and make possible a better way of living for his whole family?

A GOOD PRICE FOR GOOD MILK, AND HOW WE PRODUCE IT.

(By J. A. Miles, Gray's Summit, Mo.)

Spring Hill Dairy Farm is situated 42 miles west of St. Louis, on the Missouri Pacific railroad, and consists of 280 acres. The main spring on the farm is at the dairy barn, and furnishes about 30,000 gallons of fine water per day, that stands at a temperature of 56 degrees.

My mother moved on the farm with her parents from Virginia in 1832, and the family has lived here continuously since. I was born here in 1850. The system of farming, if I may call it such, consisted in raising grain crops, and hauling them off the farm. The principle crop recently has been wheat. Where we formerly raised 20 or 25 bushels per acre, the yield came down to 10 or 12 bushels.

About five years ago I saw that there would have to be a reformation or a separation, so about three years ago I bought nine cows, and milked them in an open lot. I made butter and hauled it six miles, and sold it for 18 cents—one-half in trade and the balance in cash. The next season I sold my product as a 32 per cent. cream, and received 60 cents per gallon for it from the St. Louis Dairy Co. I then built my dairy barn and increased my herd to 50 cows of mixed breeds, Jerseys predominating. My herd bull is a royally bred Jersey, a grandson of Old Pedro, and came from J. Q. Emery & Son, Albion, Wis. I have about twenty head of heifers of his get from my best cows that promise to make fine milkers.

My barn is 100 feet long, 36 feet wide, with cement floor. Cows face outside wall with 8-foot driveway through center. There is a tongue and grooved floor in the loft, and the ceiling to the cow barn is tar paper, which makes it dust proof. The barn will hold 54 cows, and is equipped with the King system of ventilation.

The platforms which the cows stand on are of different lengths to accommodate different sized cows. I have been using ground rock phosphate in gutters to absorb the urine. The manure is hauled every day direct to the field and spread.

We have two "Buff Jersey" stave silos that hold 360 tons, and they keep the silage to my entire satisfaction. We filled them last fall from 28 acres of corn. To say that I am well pleased with the silo, is putting it mildly, as I think them as far ahead of the old way of handling feed as the noonday sun is ahead of the lightning bug.

We have a galvanized tank in the loft of the barn which holds a thousand gallons of water, and is piped all over the barn and milk room. In cooling our milk and scrubbing barn, which is done daily, and washing milk vessels, we use about two thousand gallons of water per day.

The cows are fed bran just before milking. They are then groomed, and a chain fastened across the stanchion to prevent them from lying down before they are milked.

The milking is done by hand by three colored boys, who have suits that are not used for anything but milking. They wash their hands with warm water soap and nail brush just before they start milking. Each one has a bucket of clean water and a rag to wash the cow's udder and a clean towel to dry their hands.

After washing the udders of five cows they take clean water. The first few streams are discarded, and then the milking is done in the Gurler pail, and as fast as it is milked it is run over a Star cooler and reduced to a temperature of forty degrees within ten minutes after it is milked. It is bottled at once, packed in cedar tubs, iced and shipped to the St. Louis Dairy Co. It arrived there a number of times last fall at a temperature of 38 degrees. We finish milking at 5 o'clock a. m., and the milk arrives in St. Louis two hours and 45 minutes later. The milk contains 5 per cent. butter fat, and I receive 30 cents per gallon for it. About one-half of the milk is sold as "certified milk," and the balance is sold as the "Walker-Gordon" product.

When through milking the vessels are rinsed in cold water, so that the milk will not dry on them, and then they are scrubbed thoroughly with brush and warm water, into which has been put some good washing powder. They are then sterilized with steam for one hour. The strainer cloths and wash rags are taken through the same process, and in addition they are boiled for one hour. We discard them after being used for a short time and get new ones. We use every precaution to keep down dust in the barn, knowing that every particle of it is heavily laden with bacteria, and that if impurities get into the milk in solution it is impossible to remove them without heating the milk, which injures it as an article of food.

I think there is a bright future for any dairyman who will make a uniformly clean milk, and, furthermore, I am sure he is engaged in a very laudable undertaking. The watchwords at Spring Hill are "clean and cold."

If I have attained any degree of success in the dairy business (and I think I am now losing money slower than I ever did in my life), it is due very largely to the sound teaching of Hoard's Dairyman and Coleman's Rural World, both of which I regard as without a peer in their chosen field of labor. While there has been considerable labor in developing one little dairy plant, I have been amply repaid for it all by the fidelity of my family and friends, who have assisted me in every possible way.

This development has had its humorous side also.

While I was building my barn and first silo, an old friend of mine came here to see me, and, after looking around, I asked him what he thought of the barn. He said he thought it was a fine barn. I asked him what he thought of the silo, and he replied that he didn't know anything about a silo, but that it was a good job of work. Then I told him I hadn't asked him the main question yet; what do you think of me? He looked me straight in the eye and said, "Crazy, by gum," and I think he voiced the sentiment of a large per cent. of the community.

THE COST OF NEGLECT.

(By Dr. D. F. Luckey, State Veterinarian, Columbia, Mo.)

Any attempt to summarize the total cost of neglect in a paper of reasonable length must of necessity prove absolutely futile. The items of loss, if enumerated, would require a volume for their statement. If the total cost could be reckoned accurately, the amount would seem incredulous. In view of the fact that this paper must be brief, it seems best to confine it to the discussion of the losses from neglect to prevent contagious diseases, particularly those of dairy cattle.

Sound information concerning the prevention of contagious diseases, and the treatment of those that will yield to treatment, is being spread broadcast over the land in bulletins and agricultural papers. It requires courage in many cases for the editor of an agricultural paper to publish the plain truth. At the present time many of the leading agricultural papers are daring to state the cold facts. The public neglects to read and neglects to believe. The loss from this neglect can not be estimated.

Many of those who have read and who know definitely and well what steps are necessary to prevent the various contagious diseases, neglect to take those steps. In summing up the cost of such neglect we would have to count the losses from contagious diseases, diseases which amount to millions.

The dairyman is subject to losses from blackleg, calf scours, garget, hog cholera, contagious abortion and tuberculosis. While blackleg is not as common among dairy as among beef cattle, yet well fed dairy calves should be vaccinated to prevent it. The dairyman neglects to provide clean quarters for his cows at calving time, and his neglect frequently results in a heavy loss from a contagious form of calf scours. He neglects to care for the udder of the heavy milking cow at the proper time, and his neglect causes the loss of the function of a profitable udder on account of garget. As all other farmers do, the dairyman neglects to prevent the exposure of his hogs to cholera, or allows the infection to be brought to his place, and the cost is already well known. Again, the dairyman neglects to take the proper precautions in breeding his cattle, and allows his herd to become affected with contagious abortion, the cost of this neglect being already well known to only too many dairymen. The dairyman neglects in building up a herd, to take the simplest precaution to know whether or not the animals he is bringing together are free from tuberculosis. Through this neglect, this dreadful disease is getting a foothold in many of the herds of this State, and the loss therefrom, if properly summed up, would require a paper much longer than I dare make this one.

It is proper now to speak of losses from these diseases as being caused by neglect, for the reason that full directions concerning their prevention have been published over and over in farm papers and official bulletins.

The ultimate loss from tuberculosis is found to amount to more than the loss from all other diseases put together. By the neglect of a very simple precaution the dairyman allows his herd to become affected. The disease spreads among the cattle, and slowly, but surely, they succumb to it one by one. The milk from an infected herd carries the disease to every animal to which it is fed. The hogs from an infected dairy go to slaughter only to be condemned and lost. Sooner or later the fact that some dairyman is selling milk from a lot of cows rotten with tuberculosis becomes known, and reflects great discredit upon the dairy industry. Many who are able to pay for milk and are willing to buy it of the dairyman, are forever turned against its use. Many are scared into attempting to raise children without milk, which is suicidal. The germ of tuberculosis from cattle produces a virulent type of disease in the other lower animals. Scientists now almost universally concede that the cattle tuberculosis is transmissible to the human. A close study of this subject will drive anyone to the same conclusion. The indications are, that in the cost from the neglect to prevent tuberculosis among dairy cattle, must be counted a large number of human lives.

Instructions for the prevention of hog cholera and tuberculosis were given to the public in time to have been made use of during the past five years. In that time the State of Missouri has lost about eight million dollars worth of hogs from cholera. At least three-fourths of this could have been prevented except for the neglect to follow instructions that were plainly given. In the instructions that were published in the market reports and nearly all of the agricultural papers of the State, in September, 1902, it was strongly urged that when stock hogs were brought on to a farm they should be kept in quarantine for thirty days. The neglect to read and heed this particular item of advice has cost the farmers of this State close to $6,000,000 since then.

Some three years ago an anti-spitting ordinance was passed in St. Louis and has been reasonably well enforced ever since. Apparently, as a result of this, the death rate from consumption decreased only slightly. *The indications are that there are other sources of infection which the health authorities are neglecting to remove.* At any rate, in spite of the anti-spitting ordinance, there were 1,009 deaths from consumption in St. Louis last year. There were probably 4,000 deaths from consumption in the State of Missouri during the last year. The nursing and burying of consumptives in the State of Missouri costs something like six hundred thousand dollars each year. On a recent visit to the tuberculosis ward of the city hospital of St. Louis, I learned that in four years, in spite of the most magnificent care, ten patients were turned out alive and 895 dead. I believe that all of this can be counted as the cost of neglect. The sources of tuberculosis infection to the lower animals and to the human family are well known to scientific men. If losses from this disease are permitted to continue in the future, not only immense sums of money spent in nursing and burying consumptives, but a heavy loss of human life *must* be charged up to "the cost of neglect."

In order that the statement that all contagious diseases of both the human family and the lower animals can be completely prevented may not seem incredible, I need only to call attention to what has been done in the past. *Every contagious disease of man and beast of such aspect as to scare the public and drive people to follow scientific advice, has been completely stamped out.* Foot and mouth disease, and contagious pleuro-pneumonia, both of which are more difficult to control than tuberculosis, have been wiped off of this continent. I venture the statement again that many scientific men have sufficient knowledge of all the contagious diseases to give such directions as would, if properly carried out, absolutely prevent loss from them. Those who are in official positions have frequently and willingly published the information necessary for their control. If the live stock owner neglects to read, neglects to believe, and neglects to follow the directions laid down by competent authorities for the prevention of contagious diseases, he is bound to contribute his share to the cost of such neglect.

OUR DUTY.

(D. A. Chapman, State Dairy Inspector, Missouri.)

Mr. Chairman, Ladies and Gentlemen—The dairy industry of Missouri has for its leader a man of remarkable energy, foresight and endurance, who is always in the lead, and he was ably assisted by his Deputy Commissioner; but they complained that for them to spread themselves out over great big Missouri, they became awfully thin. They saw the need of education and training in the dairy line, and need of reforming as well as forming. They noted the disregard for law and right, the prevalence to adulteration and preservative, and the rapidly increasing death rate therefrom among the children. People were coming to them and asking what shall we do to be saved, me and my entire household; these men could sound forth the notes of warning and alarm, but could not follow them up and be everywhere. They could not accomplish anything like the laws demanded or what they saw the great necessity of doing. They appealed to the legislature for aid, and this was granted them last year, and a new force of helpers were put to work last July. These new helpers were given the name of inspectors, one of whom I am. Although I came into this work from the farm and dairy I am only six months old in this cause, and, being only a babe, desiring the sincere milk of the word myself, I feel a great hesitancy in talking to you on "our duty." However, having a capable and patient leader, and trying to profit by my short experience, I believe I have learned a few things well, and one of them is that duty is not always a welcome visitor, or even an agreeable companion, and may be divorced, if given half a chance. Her path does not always lead by green pastures, or beside still waters, but oftimes over difficult mountains and through stony places; but, perhaps, it is this diversity that makes her path, with all, to be called a pleasant one.

In the analysis of the word "inspector" we find the root word spec is taken from spectum—to look; the suffix is or—one who, and the prefix in—into or within. The word meaning, then, "one who looks into." But the word in the hands of the people seems capable of being bent or twisted to give us the cognomen that expresses their degree of appreciation or non-appreciation of our proffered services. So we start out in our first duty with the name of leader, guide or teacher. No duty can be more responsible or require greater knowledge or skill than that that has for its object the training and education of the dairyman—and allow me to say right here that Prof. Fraser has given up this task as a hopeless one, and at present is trying to educate the rising generation in the rural schools along this line—and it is our duty, as well as our pleasure, to be a thorough student in our special line.

While very much can be learned only by experience there are many facts, principles, theories and experiments already established which we should as an essential part of our professional work acquire and know in a masterly way; curiously, too, the reasons and results—things to inspire confidence.

I am often reminded of the days of the old log school house, when each and every one thought it to be his duty to hunt out sums to stall the teacher. There are so many things the progressive dairyman want to know about, not only the handling of milk, how to produce a more cleanly article, but of balanced rations, silos, kinds of breed and breeding, and many other things. Of course, no one has a patent on all knowledge, and these people seem grateful for any knowledge, information or suggestion given, and regard us rather as Samaritans to help them, and they are anxious to receive the word of the old, yet ever new gospel of progress. So you see the need of co-operation in the various lines; the knowledge and inspiration to each of us in these general meetings, where one can exchange ideas, and tell of our trials and pleasures, learn our lessons better, perform our duties more faithfully, and confess our willingness to be forgiven for our mistakes and blunders and all lend our names, our dollar, and our influence to help along the great agricultural work in general. Now, it seems, lest we become puffed up or surfeited with good things and pleasures of the way, the path of our duty suddenly turns in a different direction, and we find ourselves on the enemies ground; people who, having eyes, see not; ears, hear not; consciences, used not; they have no regard for law and right, and filth adulteration and preservatives seems to be their pass word to supposed success. These preservatives are used to cover up the filth and dirt, and to these people our cognomen is—scout, detective or spies. They always remind us that the milk is perfectly clean and pure, because they have strained it, and this ever reminds us of an oft-repeated story of the faith of the woman, who, after having strained the milk once and setting it down on the way to the cave left it a moment for some other duties. Bruno chanced to pass that way, the woman, on seeing this called, "get, you nasty dog, you have caused me to strain that milk again."

We have seen many wagons labelled "sanitary milk." Upon examining this milk, and seeing the manure settled in the bottom of the bottle, reminds us of a woman (who, attempting to remedy this, put two pitchers on the porch, and when the milk man came along and asked the lady if she wanted two quarts of milk, she said "no," one would do; but if it didn't make any difference to him, he could put the milk in one pitcher and the manure in the other. The above incident did not occur in our own State, but we, as individuals, are daily eating our portion of the 1,000 pounds of manure as a part of each day's rations consumed by the good people of Missouri. Now, good people, don't get scared; you must eat your peck of dirt, and some say it might as well be in the milk.

It has been our lot to visit city dairies where, from all appearance, the cows are chained to the same post month after month with no sunshine and very little pure air, and the filthy condition of these stables make it impossible to produce a clean milk therein, and I wish to add that the bad conditions are not all found in large cities. Often the cows in the country stand and lay in their filth, uncleansed or unwashed, before milking, buckets smelling, etc., and more often the lack of elbow grease than more paraphernalia. There is a class who look upon us as their enemies, and when they learn we are in town, will leave their routes, scurry to their dens, leaving their patrons unsupplied with milk. It is these people who are the transgressors of the law, and it seems their desire is to evade, rather than obey it. It is not the ignorant dairyman who adulterates and uses preservatives, as a general rule, but the man who is fairly well posted. He does it for the almighty dollar, regardless of results.

Nor can we, in doing our duty, pass unnoticed one other line—that of tuberculosis. It has been our observation that many prefer to go on distributing these death-dealing germs, rather than lose the paltry sum that these diseased animals are worth, and when the matter is brought to their attention, their cry is, "why don't the State pay for these animals?" never stopping to think of the number of human deaths this germ-laden milk will cause.

It is this same class of people or dairymen who avoid the pure food men, and, when finally cornered, stand sullenly by, and act as if we were the culprits, and they the offended ones, and even then try to cover up, deceive and excuse, and after being shown—we show in Missouri—will twist, pervert and misrepresent when we are gone. And allow me to say, the number in this class is larger than one would suppose. I have been taken for a doctor, preacher, teacher and farmer, but never until recently was I taken for a criminal lawyer. To illustrate—this party, in question, after being informed as to the facts regarding his products, wanted me to tell him some way he could evade the law, in fact, if not in appearance, and yet seem to be within its pales; I bid the gentleman good morning.

Now, good people, be patient a moment, do not condemn us for not giving the good, clean dairymen as much space and time as we have to the other class. It is true, we have them; they are with us; their number is small, yet not so small as not to be noticed.

Of the total number of places visited, we find the number of good, clean dairymen producing an ideal article are less than the number of towns inspected.

It is not customary in any line of work to praise the efficient; yet we have men who are producing a milk with less than two thousand bacteria count, which could be classed with the certified products. However, the ones who are producing this high-class article are making no fuss about, but are making money out of it, and they are constantly striving to put a good, clean, wholesome product on the market.

In the number of samples inspected we find 39.3 per cent. below the State's standard in butter fat; 25 per cent. of the total number of samples were watered; nine per cent. had preservatives in them; 31 per cent. too filthy for any human being to use; 40 per cent. might be classed in the medium list, with 20 per cent. fairly clean.

Just what per cent. had tuberculosis germs can never be known. There are many dairy herds in Missouri of which I have knowledge that from 50 per cent. to 90 per cent. of the cows have been found with tuberculosis. Some, though cows dying, refused to have them tested. Great waves of epidemics, dyphtheria, scarlet fever, typhoid fever and infantile troubles can be traced to its original source—milk or poison foods. I have seen enough myself, and have statistics on that line, that I am ready to state and believe that I can prove that dirty and diseased milk products and poisoned foods, yes, I believe I can say, the white plague germs in milk alone causes more deaths than all the alcohol drinks combined, and I maintain that he who for want of energy or through carelessness or knowingly cause germs to drop in the milk and grow and increase, or puts poisons and preservatives into it, or knowingly scatters abroad germs of the white plague, or other contagious diseases, is no less an assassin than he who plies the dagger. I am fully aware that it is often a source of great personal risk to tell the truth, to discharge our duties faithfully and honestly, and that the commercial and financial instincts of some people have been so trained as to impel them to desire only half-told truths, or suppressed truths, or white-washed the lie to appear like the truth. How important that we who are to keep the lead and to spur others on to duty to possess those God-given attributes ourselves. It is our duty to tell the truth, the whole truth, and nothing but the truth, to stand for quality and purity, condemning where condemnation is due, and praising where praise is due without fear or favor, without prejudice or sugar-coating, and be careful, lest we become noted for our much sayings.

I believe the foundation has been laid for better work. Already in the hand writing on the wall we read "a better day is coming, the morning draweth nigh." The death rate, especially among children, has become greatly lessened by the dairy and pure food laws of other states, and we are following. The sentiment is growing. Municipalities are lining up with ordinances that aid in enforcing the laws. Our State Dairy Department is doing a grand work, and is full of young people, learning the better way, and who, as they go out over the State, will exert a wide influence. Our State normals are teaching the young people in the right line. Institutes are being held over the State to enlist, interest and instruct. Rural schools in their agricultural work are looking to this line. Forces are gradually gathering which foretell great advancement and great reformations, which will compel the transgressor to have a great change of heart, for the time is coming and is near at hand when "by their fruits ye shall know them, and a tree that bringeth forth not good fruit will be cast out," boycotted and supplanted by the good in all things dairy.

MY EXPERIENCE WITH THE SILO AND MILKING MACHINE.

(By Philander P. Lewis, Crescent, Mo.)

I presume the reason I am assigned to this subject, "My Experience With the Silo," is from the fact that at this time the experience of the farmer is worth as much, if not more, to the farmer or dairyman than the facts as he is able to take them from much more scientific sources, such as are handed him by our Experimental Station, or by the many able writers on the subject from every quarter. Shall, therefore, hold with you, an old-fashioned Methodist experience meeting.

To begin with, will say that the increasing prices of all kinds of feed for dairy cows some five years ago, forced me to cast about for something cheaper than could be raised at home, as well as take the place and produce the results of the high-priced feeds. Investigation along these lines caused me to come to the conclusion that silage, if properly handled, would largely answer this very important question. Taking the matter up with the president of our dairy company, I was informed that in the production of high-class milk, such as we were producing, the Walker-Gordon Department of the dairy in the east had pronounced against this class of feed, and had been forced to exclude it on account of the so-called objectionable flavors emanating from feeding same. After some persuasion I was granted permission, to at least give it a trial and submit the product to rigid tests for flavor or other objectionable features, and to refrain from using, if found at all objectionable. A silo was erected and filled with corn September, 1904. Contrary to the expectation of our very careful dairy company, the milk was not injured, but improved by the judicious feeding of silage; the milk had a better color, showed greater vitality, or, to use a more common expression, "standing up" better than before its use. Not only was this the case, but the cows themselves were easier to keep in condition, showing sleek and healthy condition, and gave a better grade, and a more even flow of milk. This latter being of great importance to the dairy company, in fact, gave better results than rich concentrated feeds. We found that by feeding an average of about 30 pounds of corn silage per cow, say 50 pounds, to heavy milkers and proportionately to those of lighter flow, the feed bill was materially decreased, and with gratifying results. Previous to its use the grain ration was about three pounds corn, three pounds cotton seed meal, and six pounds bran, hay (clover or alfalfa) ad libitum. After feeding silage, the ration of grain was reduced 50 per cent., and the hay at least 25 per cent., and after experiment proved these figures conservative.

Beginning October 15th, to December 15th, 1907, I maintained a splendid flow of milk on corn silage, and that most excellent of all feeds for cows, alfalfa, all home grown, using no mill feed at all. Commencing December 15th, I added to this ration three pounds of bran and three pounds of cotton seed meal, and found that, while this increased the output some, it was not more than enough to pay the added cost. Proving conclusively that it is possible to produce on our farm a ration that will accomplish the results so much desired by dairymen—a full milk pail, with small outlay. Have tried feeding silage to calves and hogs, as well as to horses, and find they all take to it, not only kindly, but with great relish.

My friend, Mr. Shields, of Eureka, Mo., is feeding at this time a herd of 40 heifers on nothing but corn silage, with wheat straw for roughness; calves showing healthy and growthy condition.

A visit to Dr. Crowley's horse farm, at Allenton, Mo., found them feeding silage, composed of one-half green oats and one-half cowpeas, and was assured by the Doctor, who is a scientific and painstaking gentleman, that the brood mares and colts had been easier to take care of and keep in healthy condition on this feed than on the ordinary hay and grain, and for horses he has found silage the most economical and best way of feeding.

I have previously suggested that in feeding silage to dairy cows, there might be danger of contamination by odors or flavors being taken up in the milk; if such has been the case in other dairies, I believe the cause can be laid to improper feeding, or not feeding at the proper time. My rule is to feed after the milking hour, when all the milk has been removed to the cooling room. We all know the susceptibility of milk, and know that its surroundings must be clean, pure and sweet to prevent contamination. Therefore, in my opinion, cows should never be fed any food from which odors are likely to arise just before or during milking, and that all troughs and feeding alleys should be clean and free from anything like decayed matter or refuse.

The production of certified milk requires the most careful attention in this matter, and should be the rule with everyone milking a cow. Have had no experience with other than straight corn silage, and the corn being used so far is the ordinary St. Charles white corn, planted in the ordinary way. Some checked, some drilled, planting three feet eight inches in row, 15-inch drill. This allows plenty of sunlight and air, and in ordinary corn weather, assures a healthy, strong growth and well eared corn, which I find makes the best silage. This method of planting should produce from 12 to 15 tons per acre. I find the proper time to cut and store is after the grain has become well glazed or in the dent, perhaps more plainly speaking, about two weeks before corn would be right to be put in the shocks.

Experience shows that corn cut earlier than this has too much moisture and fermentation; contains too much of an acid condition, and is not so well relished by the cows. Alfalfa, oats or peas should be cut before fully maturing, and put up after the mower.

COST OF STORAGE.

Have found the average of the past three years to be approximately 62 cents per ton, this based upon a wage scale of $2 per day for labor, $3 for teams, and $5 for engine. Of course, this will vary and be governed by the length of haul, which, in my case, is about one hundred yards.

As to cost of erection, I can only refer you to bulletin issued by the Agricultural Department at Washington, as well as to the ably edited Dairy report of Mr. R. M. Washburn for last year. To sum up, then, I consider that my experience with silage has been very satisfactory, not only has it taken, and to a large extent reduced, expense for high-price milk producers; it preserves all the food values of the corn, both stock and cob. This later being given by our experimental station at 40 per cent; these figures being, I think, too small, as I am sure condition of feed in palatable, succulent conditions amount to something not previously taken into account. Aside from the convenience, as well as economy, of having the feed stored at hand in shelter, no hauling in bad weather or mud, no unsightly shocks, fields clean and ready to be used as farmer desires.

It should be a pleasure as well as a duty for us to give the best of care to our dumb friends, and that care cannot be properly given, except one take advantage of the advances made by scientific researches and the experience of others. And to secure this knowledge we should apply ourselves diligently to reading of good literature on such subjects; take advantage of gathering of this nature; to attend and profit by experiences that may be given. My experience with silage tells me that it is as palatable to the dumb friend as our green canned corn is to us. I further advocate the application of scientific methods to the farm; gathering greater harvests from your lands; fertilization and building up of the soil, applying labor saving devices, surrounding the home with modern comforts, eliminating drudgery, and in so doing entwine around the hearts of the loved ones of your fireside that love for the old farm that cannot be overcome by the enticements of our large cities.

MILKING MACHINES.

Perhaps the most interesting subject with which I have to deal at this time, is my experience with the milking machine.

This subject appeals to everyone in the production of milk in merchantable quantities as it has been almost impossible to secure good milk men during the prosperous times of last several years, because of high-priced, as well as scarcity of first-class help on the farm.

I have been interested in finding, if possible, a milk machine to answer this important question. Finally, after careful investigation, I contracted with Mr. A. O. Harwood, of the W. H. Barber Creamery Package Co. of Chicago, for the installation of a complete outfit of the B. L. K. M. M. Co., consisting of six milking machines, power to operate same, piping, etc. These were placed, under their instructions, and operating began February 1, 1907.

Was well pleased with initiatory performance; found cows took to it kindly, very few making any trouble, and only for two or three days, after which the whole herd stood perfectly quiet. Some few of the older cows holding back their milk; young cows and heifers milking much quicker and easier, giving better results than older cows, and found only slight decrease in quantity—no more than could be expected with any change of milkers. Quality was apparently unaffected.

Until becoming familiar, one man was placed to a machine; soon as man and cow became accustomed to same, then placed man in charge of two machines. Everything went along satisfactorily, using three men instead of four, as had been done previous to installation; one of the men caring for the milk in the cooling room, other two attending to milking with machine, thereby reducing the cost of help one man, or 25 per cent.

I have found that it was much harder to teach a man to operate machines successfully than to milk by hand. Have had quite a little trouble teaching operators the importance of getting the right-sized teat cups and mouth pieces to fit each cow, as this point is essential in the successful use of milk machines, and cannot stress this point too much. I believe much of the trouble with machines to arise from this source; have found, therefore, the change of operators to be much more costly than any change of hand—for the reason having once learned the machine and cows, if for any reason he was out, many more cows were affected than by hand.

Machine milking 40 and hand only 15 to 20—any change be detrimental. Will say right here that our Walker-Gordon Dept. of St. Louis, in its daily examinations of the milk made by machines, found it very satisfactory, there being small count of bacteria, per cent. often as low as 2,500 and never exceeding 10,000, which, as every one familiar with the making of certified milk knows to be of great importance, so had little trouble, if any, from the product from that source.

The machine is very simple and easy to clean. First drawing cold water through them as in milking, after which wash in hot water, with handful of wash soda then thoroughly steaming or sterilizing every part of them. It requires little more time, and patience than the ordinary milking vessel.

Noticing a decrease in amount of product, as compared with former years, about June 1, decided to milk by hand for 10 days, carefully weighing and testing milk, to find, if possible, the reason for the shrinkage, and to test the different methods. This test seemed to bear out the fact that the machines were doing good work, and I again began their use, and continued during the summer months. Have found the expense of operation, consisting of repairs, fuel, oil, etc., to be approximately $25.00 per month. Repairs, such as worn out rubber mouth pieces, broken teat cups, etc., amounting to about $10.00, balance in fuel to operate the steam ejector, or power.

On my return from the Sedalia Fair, early part of October, I found the cows to be doing exceedingly poor, a marked decrease in milk and a perceptible decrease in butter fat, which the records of the St. Louis Dairy Co. will show.

I determined to again test the herd by hand. and commenced about October 10, at which time we were making an average of 112 gallons per day from 68 cows. A few days later I found 16 of the 68 cows giving an average of only 6 pounds a day; those I cut and turned over to pasture. At the end of two weeks, after this reduction of herd was producing 120 gallons of milk per day with 52 head of cows; showing that there was a gradual decrease of product during the summer, and, I believe, without doubt, this loss was due to the operating of the machines. While the cows stood perfectly quiet and docile, and were apparently comfortable, no pain or hurt being caused by their operation, but the decrease showing that the machines did not produce the best results. Therefore, in conclusion will say, have put aside the machines, and am milking by hand, gradually increasing our output, as records will show.

Trusting I have fully covered the subject, I leave the results to be digested by my fellow farmers and dairymen, and willing at all times to answer questions to the best of my ability.

IMPROVED DAIRY METHODS.

(By J. E. Roberts, Bolckow, Mo.)

In improving our methods of dairying I can see no better way than to improve on the class of labor we employ. We should have at least one man who has had some training at one of our best dairy schools. Of course some of these young men are somewhat technical at first, but they soon get over that when coming in contact with the practical work.

Now if you wanted a decent hen coop built the first thing you would do is to employ a carpenter; yet you will employ in your dairy, where it requires as much brains and skill as to build one of our modern structures of today, a man who knows simply nothing about the care and feeding of cows, one who does not know there is any difference in the feeding properties of clover and timothy hay. These men may be bright and energetic, and with training would make good dairymen, but they lack that one thing—training. It looks like up-hill business to pay these men a salary to experiment with your stock and dairy equipment, yet this is what a great many of us are doing today. I would like to ask if you ever thought of the difference between the two men; one who chooses dairying as his profession, who has spent his time and money for an education in this line, or the other who takes no interest in his work, but simply puts in his time, and is continually hunting a new job. The former chooses this work because he likes it, because his mind and ability leads him in that direction, the other because he finds nothing else to do. Now I have had experience along this line and think I know whereof I speak.

Some few years ago I employed a young man who had been a student at the Baron de Hirsch School of Woodbine, N. J., and, by the way, was a pupil of our friend, Commissioner Washburn. This boy taught me things in dairying that were invaluable. When this man came to my place the first thing he asked me was "where is the silo?" I told him I had none. I had read a great deal about the silo, but the necessity of one had never been so strongly impressed on my mind before. This fellow talked "silo" from daylight till dark, talked it all the time; the outcome of the thing was, I built one and I want to state right here that I have never invested $300 that made me any more money. A silo to the dairyman is just as essential as the milk pail; in fact they go hand in hand; without the silo in winter dairying you haven't much use for the pail.

I would like to know how many Missouri dairymen practice what I term individual feeding of cows? Too few of us, I know. There are many who feed the cow, giving 20 pounds of 4 per cent milk the same as the cow giving 40 pounds of 4 per cent milk. Now there is not one of us who would spend $2.00 where $1.00 would do if we knew it. But that is what you are doing in this case, nothing more nor less. This is a case of one cow eating another's profits. If I could only command the language I would like to impress this so strongly upon your minds that you could never forget it. In this instance alone there is a hole so large that every dollar of profit can slip through. This young man that I have just spoken of began a systematic weighing, sampling and testing of each cow's milk. We had cows that we considered only fit for the butcher, but as our books will now show, are among our best; others that were counted good went to the butcher. You not only find which are the very best ones, but this method will give you an opportunity of saving heifer calves, by which you can improve your herd. This does not require a great deal of your time; once or twice a month will do for all practical purposes. Now, by individual feeding, I do not mean that you should weigh out each cow's ration separately, but class them off in four or five classes. Have one class you give a 3-pound feed, another you give a 5-pound feed, and so on as you find necessary. After a few times you can feed this way as quickly as any other and gain unlimited results. From a financial standpoint, I would like to say a few words in regard to the feed the dairymen use, and I want you to understand that I am opposed to the use of high-priced concentrates. There is not a dairyman located on a farm in Missouri but that can raise all the different feeds that go to make up a good ration. Occasionally he might require a little cotton seed meal, which I think is the cheapest protein feed on the market. We can raise corn, oats, barley, clover, and I believe in a short time we will be raising plenty of alfalfa; if not this, I know we can raise cowpeas, which is so near alfalfa for feeding that there is no perceptible difference, and it has its advantages over alfalfa in this way: immediately after taking off a crop of wheat or oats, sow one of the early varieties of cowpeas and you can harvest a crop of hay excelled by none and leave the soil in as good state of fertility as if you had given it a coat of manure.

Some of our friends may say they have not land enough on which to raise all these crops; to those I say—build a silo and you will have 20 acres more land.

I have fed a great deal of bran, but of late have almost quit using it; when every seven out of ten sacks I open is adulterated with corn hulls and corn-cob dust, I begin to think we need a "pure feed" as well as a "pure food" law.

The most of us can improve on our methods of handling our cream and milk. Too many say "what's the use, the creamery or the milk station don't pay enough to justify taking better care of it." To be sure they are not going to pay any more until you do make it better. When I started out dairying I had one thing in mind, and I have it there still; to make it as good as I know how, regardless of price, and keep on learning. As long as I am away from home I will tell you I have never failed to get a premium on cream—now don't think I am singing my own praises; I am simply stating facts. Before I stopped shipping to the creamery they were paying me New York extra butter prices, F. O. B. my station, for my butter fat. I have a refrigerator built in one corner of my milk room which holds 500 pounds of ice, and only cost a few dollars; a carpenter and myself built it in one and one-half days. We fill it twice a week in summer, have a thermometer in there that registers from 45 to 50 degrees in hot weather, can set seven or eight ten-gallon cans of milk in this easily. I had a small cream aerator made that we pack full of ice and set under the separator spout. The cream runs over it into the cream can; over this we have a strainer. This aerator, filled with ice, takes out all the animal odor and reduces the temperature to 40° or 50°, it then goes into the refrigerator thoroughly chilled. We ship out at 8:30 in the morning. Milk gets to dairy about 12 o'clock; sometimes it is afternoon, and during all the hot weather last summer I never had a can of sour cream, and we used only ordinary shipping cans.

We have a two-horse boiler in which to generate steam that we use to steam the separator, cans and milking machines; turn about 80 pounds of steam pressure through the teat cups, the rubber hose, and in fact, every part of the milkers, inside and out are thoroughly steamed twice a day. While I do not believe in a lavish expenditure of money in purchasing machinery, yet I do think that a reasonable amount of modern appliances are necessary to run an up-to-date dairy. Whenever and wherever I think I can better the product of my dairy and lessen the amount of labor, by adding some piece of machinery at a reasonable outlay, I feel it is economy to do it.

In August of 1906 I installed the B. L. K. milking machines. The first few milkings the cows fell off in their milk but gradually came back to a normal flow, and continued giving as great a flow as by hand. I found the machines easy to keep clean and the wear and breakage is practically reduced to a minimum. We use a steam jet to sterilize the hose, teat cups, in fact, all parts of the machine. After successfully using the milkers for a period of 14 months we discovered a decrease in the production; we did everything possible but could not hold the cows up, so discontinued the use of the milkers and began milking by hand. Part of the cows showed a slight increase in milk flow, but in no case did a cow show any decrease after beginning to hand milk. We continued hand milking for ten days, weighing each cow's milk, then again began machine milking. The cows began failing again. We were particular to strip each cow after using the machines, but we found the longer we used the milkers the harder it was to get the cows to let down what milk remained in the udder by stripping, and in some cases they would not let the milk down at all. At present we are milking by hand and the cows are doing nicely under the same conditions of weather and feeding.

Since installing these machines I have been very generous in their praise and even at this time I am loath to condemn them because there might be other conditions that caused this trouble. I am led to believe the cause of this trouble is lack of manipulation of the udder—hence, if one is compelled to thoroughly manipulate each udder the amount of time taken to do this and care for the machines will more than balance the time of hand milking, to say nothing of the extra expenditure for the machines. I have thought that the continual use of these machines, by their lack of manipulation might cause a dormant condition of the udder.

However, I hope to see in the very near future, these machines so perfected that they will be a success, as their assistance would be of great benefit to the dairyman.

BREEDING PURE STOCK AND HOW TO MAKE IT PAY.

(By B. L. Bean, Cameron, Mo.)

When the Secretary wrote me requesting me to write on this subject I told him I could not do justice to it. He answered by telling me to tell how I had gotten along in just plain English. Now, all I have done in this line any "dairy farmer" can do.

A few years ago I was raising beef cattle from common cows. We made what butter we could besides raising the calves. This made plenty of work and gave only small return for it. An opportunity came to sell whole milk on the butter fat basis and we started at it. This paid better and was less work.

I bought a number of good red cows, also subscribed for a good dairy paper and tried to learn as much about type and the relative value of all different feeds for cows as possible. I experimented on these cows but found they were not what I wanted. I found some men that had high grade Holstein cows to sell. They had started in 20 years before with a good type of short horn milk cows and crossed them with pure bred Holstein bulls so that their youngest cows and heifers were nearly full bloods, and as good as to type and markings as pure breds. This herd is a good example to show what a man can do by following a straight line in breeding. I bought seven of those cows and as they freshened, weighed their milk and compared it with the other cows. The poorest one of the Holstein cows gave 40 pounds of milk per day at her best, and the test of the butter fat of the whole herd didn't decrease.

I then purchased as good a registered sire as I could get and sold the red cows to a feeder. After I had milked the grade cows a year I was satisfied with them and I added two pure bred cows to the herd. I thought that I might just as well raise a few that would sell for from $50 to a $100 at a year old as to raise grades that would bring only one-fourth that amount.

I bought a cream separator and fed the skim milk to the calves and pigs; finding that I had more milk than I could feed I bought eight red steer calves and raised them with the two calves from the registered cows. They did well, weighing about 600 pounds at a year old. But when the calves were sold the two pure breds brought as much as the eight beef calves. As they had been fed just the same this gave me something to figure on, and as a result I replaced the grades as fast as I could with pure bred cows and heifers. Have fed and cared for them as well as I could and they have paid me well.

One other requisite of a good breeder is to be a good feeder. Some say that it does'nt pay to feed, but my cows pay me for corn meal fed to them when on pasture—that is a reasonable amount. I have had a two-year old heifer give me 60 pounds of milk in one day and over 10,000 pounds in a year, but she was well fed and well cared for. My plan is to feed the heifer well before calving and get her to make as good an udder as possible. When she freshens milk her at least three times per day. This will relieve the udder and reduce the inflamation if there is any. It will also stimulate to milk more and give her much more capacity. This plan should be followed for thirty days at least. I would rather have a heifer before she has her first calf than to have a mature cow unless she has been treated this way. The extra milk she gives will pay for the extra work and there are not many spoiled udders when treated in this manner. I often hear it said that pure bred herds do not pay as well as grades because the pure breeders feed heavier. If every breeder of pure bred stock would build a modern silo he would be able to keep his stock at a moderate cost and keep them in fine shape.

I expect to winter about 45 head on 8 acres of corn in the silo and for dry roughage put in eight acres of kaffir corn, sown broad cast. For protein feed I am using cotton seed meal and oil meal which, fed with corn meal, gives a good flow of milk at a light cost. If one starts a herd he should be careful in selecting his foundation. Have for your motto, "not how many" but "how good." Do not buy some other fellow's tail enders and expect them to be any better than grades. Remember that in selecting your herd leader that he is all of three-fifths of the herd.

Many ask me if there is not a possibility of the pure bred dairy cattle business being overdone. This fall I needed more cows and heifers to eat up the rough feed. After doing some corresponding I crossed several states before I could find what I wanted, and was very much surprised to see how scarce pure breeds of all the dairy classes were.

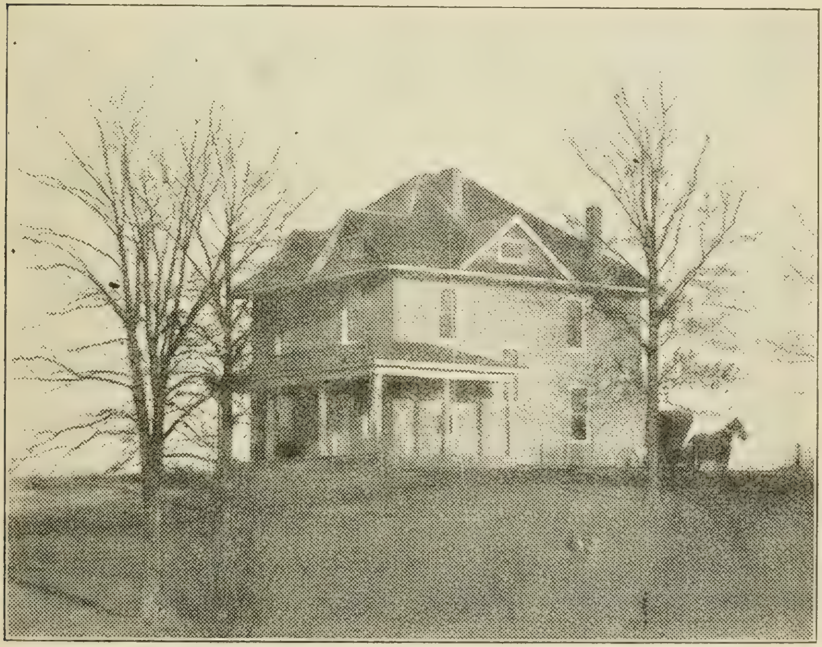
There are so few herds in t he middle west today that a man who starts a good one and developes it properly has a sure sale for the surplus of his herd.

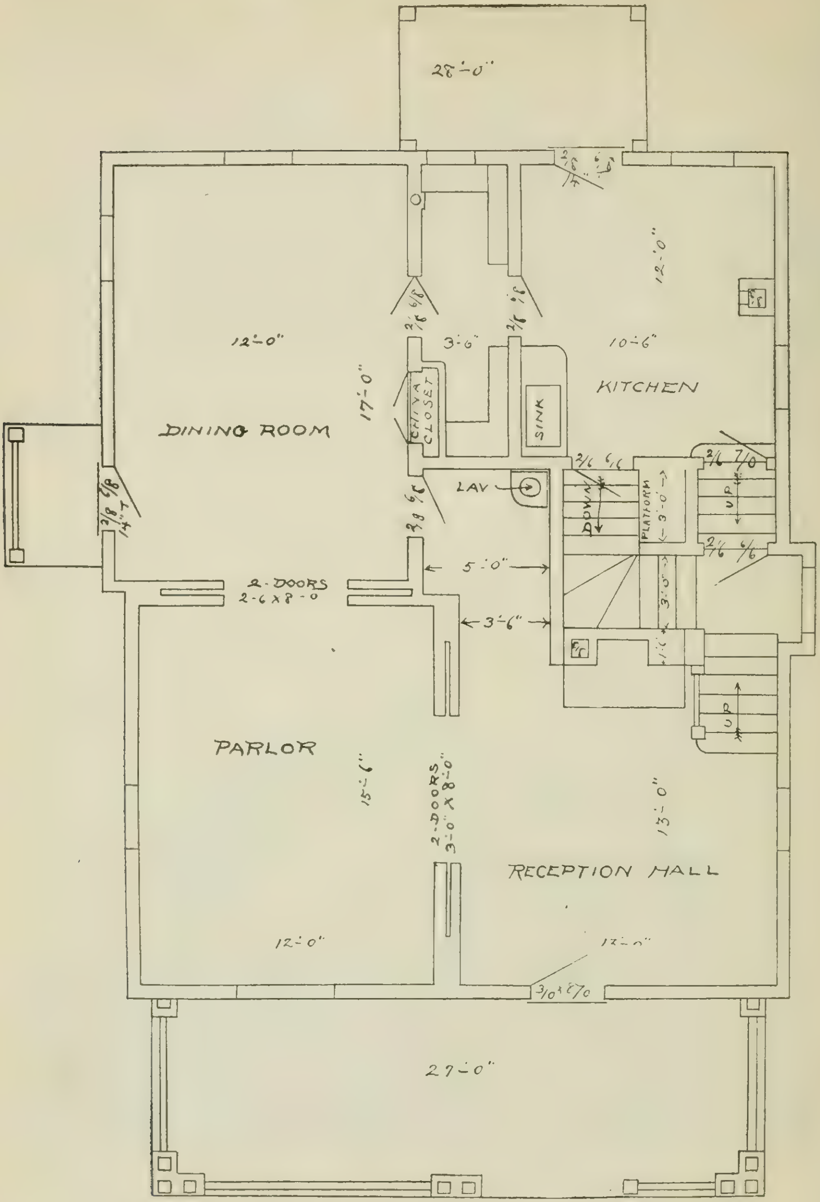
In conclusion, will say if a man expects to make a success of his herd he must study his breed well, take several farm and dairy papers and get all out of them he can.

A CONCRETE HOUSE.

(By Wm. Riehl, Potosi, Mo.)

In compliance with your request I am sending you a photograph and plan of our cement house. The size of the house is 28x34 feet; contains eight rooms and bath room; cost $1,800, including hot water heater and system; cellar 20x28 feet; built of solid concrete, one part cement and nine parts sand and gravel. We put a good many rock in the cellar walls. Thickness of walls: Footing, 15 inches; up to first floor, 12 inches; above first floor, 9 inches. Cost of excavating cellar, cement, hauling sand and gravel, and labor for putting up walls, $230. In putting up the cellar walls we boxed up in the usual way to the first floor. In building the upper walls we followed instructions given in your "Cement Workers' Handbook," page 37, except that we put box all around the building, as we found this method decidedly the best. Would have boxing not less than 12 inches; 13 inches is better. Use for the boxing or frames the best of lumber one and one-fourth inches thick,




28'-0"
12'-0"
12'-0"
3'-6"
10'-6"
KITCHEN
17'-0"
CHINA CLOSET
SINK
DINING ROOM
LAV
DOWN
PLATFORM
UP
5'-0"
2-DOORS 2-6x8-0
3'-6"
PARLOR
15'-6"
2-DOORS 3'-0"x8'-0"
13'-0"
RECEPTION HALL
12'-0"
12'-0"
3/0x7/0
27'-0"
UP

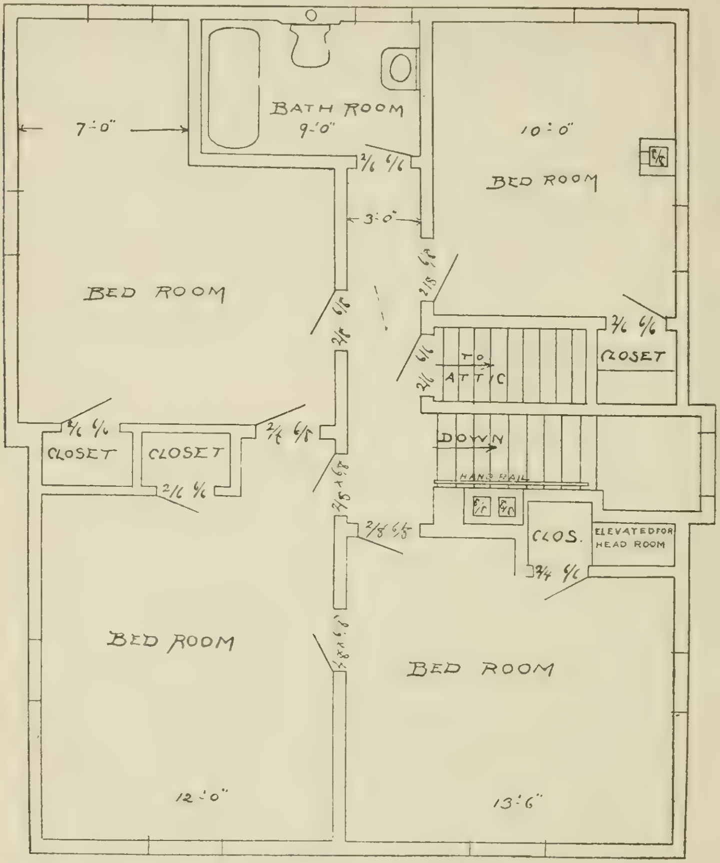
dressed on both sides, and any length you choose, and put sticks four or five feet apart. Would prefer green lumber; if dry, soak it well, as it will then cup less. Whenever it shows signs of cupping, change sides (wet side out). Where ends butt together, make sticks one and one-half inches wide. Make sticks 8 inches longer than wall is thick, and make the sticks a little smaller at one end so they will push out easily, and when you take out a stick fill the hole at once. In putting up boxing plumb the corners, and use a chalk-line, same as laying brick.

Door and window frames are made same as for brick walls. You must build them out to the thickness of the wall by nailing a one-inch strip to the outside. If the wall is nine inches thick and frame seven inches, put on two-inch strip. Also nail a strip on each side of frame (perpendicular) to stay it in the wall, and be sure to put a brace across the center of the frame so that it will not spring in when you tamp your wall. Put wood blocks in wall above floor and around door and window frames to nail baseboard and casings to. When you have your boxing up set door frames and build up to height of windows. Then set the window frame level and plumb and tack the boxing to the frames, as this will steady your frames take less sticks, and make a better wall. (Don't drive nails clear up.)

If your concrete is not too wet, you can put up two rounds a day. We filled the box half full, then tamped; fill and tamp again, not too had, just so that the water comes to top. We did not screen gravel, as we found by pouring concrete against front of box that the large gravel worked to the inside of the wall.

In building chimneys put up three sides of box; then board up four sides, as you work up. For the ordinary chimney four inches is thick enough. To make the flue, make a box the size you want the flue, cut side pieces six inches longer than front and back, nail together, keep even on the bottom, and nail a round stick on top between long ends. Place it in position, fill in six or eight inches of concrete, and tamp. When you get to top of box, take a lever, put under the round piece on top and lift box up, not quite out, then fill in and tamp again. If there is but one flue, you can go to top at once; if there are two flues in chimney, with partition between, would not go more than six or eight feet in one day. Be sure and do not have concrete too wet; it should retain its shape, if you take it in your hand and squeeze it. Our chimneys are 33 feet high; one 16x16 inches with 8x8 inch flue, and the other 18x34 inches, with one flue 8x8 inches for fireplace, and the other 8x11 for heater. They cost $17, including fireplace and hearth. If built of brick, they would have cost $125.

We have seventy feet of porches and eleven columns built at a cost for cement of $20. Lumber for same would have cost $70, and labor for wood work would have cost fully twice as much as for cement work. We built a wall around front of porch, then filled in with rock twelve to eighteen inches, tamped well, put on three and one-half inches of concrete, and finished with one-half inch mortar, one part cement and two parts sand.


7'-0"
BATH ROOM
9'-0"
10'-0"
BED ROOM
2/6 6/6
3'-0"
BED ROOM
2/8 6/8
2/8 6/8
TO ATTIC
2/6 6/6
3/6 6/6
CLOSET
2/6 6/6
CLOSET
CLOSET
2/6 6/6
2/8 6/8
DOWN
HAND RAIL
2/5 + 6/8
2/8 6/5
CLOS.
ELEVATED FOR HEAD ROOM
2/4 6/6
BED ROOM
BED ROOM
12'-0"
13'-6"

Our columns are square. Make a box the size you wish, nail two strips across the top to keep from spreading, fill half full of concrete, and tamp, then reinforce with bar of iron. (We used old wagon tires.) Place bar in center, fill full, tamp, and smooth top. Next day take off cleats and nail a board on top, nailing lightly (use six-penny nails), then turn over, take off box and leave until it hardens. If you do not tack board on top before turning you will break the corners. When you set up columns put wooden caps on top, and after you have them up you can cast a base around them.

Where upper windows come over lower doors or windows, it is best to reinforce the wall with iron bar, same as in columns, putting in two bars. We put inside finish on outside doors and windows before we plastered, then plastered onto cement walls.

We found it very important:

To have good boxing, made of well dressed lumber.

To turn boxing when it showed signs of cupping.

To mix concrete well, never too wet.

To tamp well; not too hard. Concrete work must be kept wet, so as to set slowly.

We had all conditions favorable, sand and gravel within 300 yards, water 40 yards, and $1 per day labor, hence the small cost. We left outside of house in the rough and planted Boston ivy at the sides, which will cover house in two years.

I have taken it for granted that those who will attempt a house of this kind will get the "Cement Workers' Handbook," which Wallaces' Farmer sells for 50 cents, and have omitted minor details.

RESOLUTIONS.

18TH ANNUAL CONVENTION OF MISSOURI STATE DAIRY ASSOCIATION.

We, the State Dairy Association of Missouri, assembled in 18th Annual Convention, and representing 25,000 dairy farmers in Missouri, hereby resolve:

First. We thank the Commercial Club for their liberal financial assistance.

Second. We wish to express our appreciation to the State Agricultural College for the most elegant banquet served us; for the excellent program, and are not unmindful of the efficient service rendered by the University girls.

Third. We wish to express our obligation to the State Board of Agriculture for their financial assistance, and to the Hon. Geo. B. Ellis, Secretary, for his generous efforts in behalf of our meeting; and,

Fourth. We recognize that the Agricultural College is handicapped for lack of proper buildings, and appreciate the wisdom of the recent Legislature in appropriating money for the erection of a large Central Agricultural building, and urge that immediate steps be taken by the Board of Curators to hasten its construction.

Fifth. We appreciate the great usefulness of the Department of Home Economics in our Agricultural College, and herewith express the hope that a suitable building for this work will be provided for by the next Legislature.

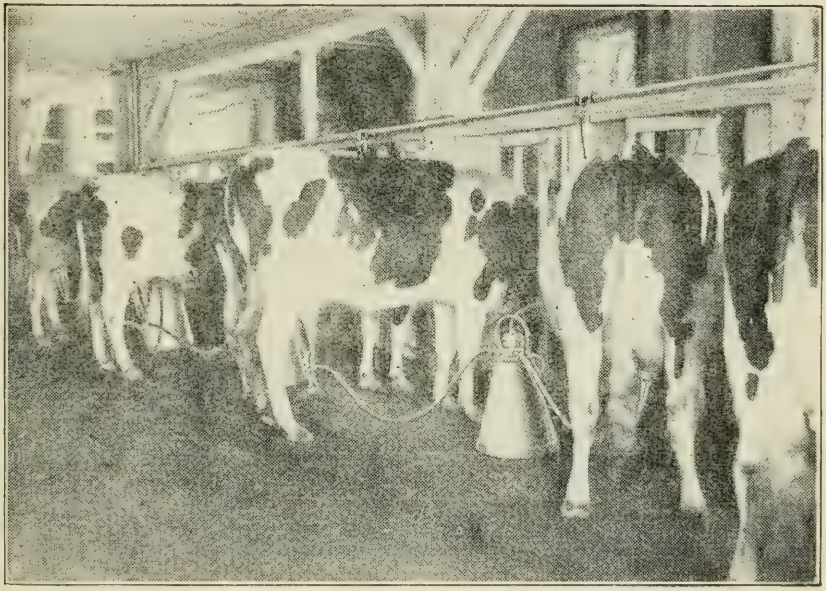
Sixth. We appreciate the great services of the Agricultural College to the farmers of the State, yet, we realize also that out of the 100,000 boys on the farms of Missouri, who were last fall of proper age to attend an Agricultural school, less than 300 individuals availed themselves of the privileges of our excellent College of Agriculture. What is the matter? An Agricultural high school is needed; one which can be entered direct from the country schools, and which teaches all the rudiments of scientific agriculture and home economy. We, therefore, do commend the stand taken by the State Board of Agriculture in regard to the matter, and respectfully and most earnestly urge the Board of Curators of the University to take such action as is necessary to start such a school under the Agricultural College by the beginning of the next school year.

Seventh. We approve the work undertaken by the U. S. Dairy Division, and favor its enlargement into a bureau, and respectfully ask the Secretary of Agriculture and the Congress of the United States to look into the merits and needs of this large work.

Eighth. We note with satisfaction the growth and development of the Dairy Department of the University, especially along the line of stock and experimental work. We find the greatest need of this department at present to be a suitable barn. For the fourth time this Association calls the attention of the Board of Curators to the fact that the barn provided for the dairy herd is not suited for this purpose. It lacks ventilation, and is not constructed so that it is possible to keep the sanitary conditions as perfect as they should be kept. We doubt if there is a herd of dairy cattle of equal value in the State kept in as inferior a barn.

Ninth. We realize that the disease tuberculosis is thoroughly distributed over the State; that it is to be found both in beef and dairy herds; that it is spreading; that it constitutes a danger, both to human health and to the stock raising industry of the State. Therefore, we demand that a law be passed giving the State Veterinarian authority to administer the tuberculin test whether the owner of the stock be willing or not, and providing that the owner be properly reimbursed out of the State treasury for all stock condemned.

Tenth. We realize that the expense of attending the State Dairy Association is the cause of keeping many, in the remote parts of the State, from being present; and realizing the need of reaching these people with the good things we enjoy here, we resolve that there be formed four district dairy associations, one for each quarter of the State, said association to be under the guidance of the State Association, and to receive such aid on the program from our State instructors as is possible for them to give, believing in this way we can reach a large majority of our dairy farmers who have not attended our State Association Convention.



Milking machine in operation.

SESSION

Missouri Housekeepers' Conference Association.

(*Held during Farmers' week in the Agricultural College, under the auspices of the State Board of Agriculture.*)

The first meeting of the Missouri Housekeepers' Conference Association was held in the rooms of the Home Economics Department of the University of Missouri, January 7, 8, 9 and 10, 1908. One hundred and twenty women were in attendance. On the last day a permanent organization was formed with the following officers:

President, Mrs. Warren Hamilton of Kirksville; Vice-President; Dr. Edna D. Day of the State University; Secretary, Mrs. M. F. Miller* of Columbia; Treasurer, Mrs. E. P. Tracy of Chillicothe.

EXECUTIVE COMMITTEE.

Mrs. Walter McNab. Miller, Columbia; Mrs. Chas. W. Greene, Columbia; Mrs. George Frankel, St. Louis.

CONSTITUTION OF THE MISSOURI HOUSEKEEPERS' CONFERENCE ASSOCIATION.

Article I. This organization shall be known as the Missouri Housekeepers' Conference.

Article II. The object of this organization shall be to unify the housekeepers of Missouri in an effort to better their own home conditions and to help future homes by encouraging the introduction and development of Home Economics in all the schools of the State.

Article III. The officers of this organization shall be a President, a Vice-President, a Secretary, a Treasurer, and three others, which, with these, shall form an executive board, the duties of the officers being the same as those of like organizations.

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*Died February 17, 1908.

Article IV. Amendments to this Constitution shall be made only by a two-thirds majority vote of the members present, ten days' notice, in writing, having previously been given to all members.

The following is a condensed report of the meetings:

OUR CONFERENCE.

(Dr. Edna D. Day, in charge of Department of Home Economics, University of Missouri.)

Housekeeping has been called a "belated industry." That this accusation is true, is due largely to the fact that until recently each woman has been content to do her house work as her mother did, with but little but her own ingenuity to suggest how to modify her methods to suit the new conditions that she had had to meet. She has been content to find out by her self the value or worthlessness of the many new foods and household appliances advertised in papers and displayed in stores or to leave them alone as probably not worth the trouble of the experiment. She has not stopped to think of the thousands of other women in the State confronted with the same problems with whom she might well co-operate in these experiments.

Some years ago each farmer worked alone in much the same way, and farming was then a belated industry. In the meantime, the Agricultural Experiment Station, the Agricultural College, the farmers' journals, institutes and conferences have done much to find out the best methods of agriculture, and to make them known to every farmer in the State, thus making possible the efficient scientific farming of today.

It is not surprising that housekeepers also are awaking to the value of using scientific methods in their work. Life has too many interests for women long to be willing to use slow, poor methods, when better ones are available. Signs of interest are visible on all sides. The women's clubs are pushing the movement. Largely as a result of their activity there has been established here at the State University, a department of home economics. However, many of the women most interested are already burdened with household cares, and consequently, can not come regularly to the University. Hence it has seemed fitting that we should follow the example of the farmers and have for a few days here in Columbia, a housekeepers' conference, in which to compare notes as to ideals and methods, and to gain inspiration by talking things over together.

A MODEL KITCHEN.

As our contribution to the conference, the home economics department of the University has set up for exhibition the full-sized skeleton of a model kitchen with all its furnishings in place. That the home maker may have the time, energy, and enthusiasm to be an inspiring companion to her husband and children, all possible effort must be made to make easy the necessary routine work of the home. There is perhaps no place in the home where more unnecessary time and energy are used than in the ordinary kitchen.

The effort has been made in this model kitchen to suggest how steps, time and energy may be saved. A floor covering of linoleum is easily kept clean by mopping—no hand and knee operation with a scrubbing brush. For best wear, an inlaid linoleum should be used, but even a cheap floor oilcloth that needs more frequent replacing is to be preferred to any wood that needs scrubbing. An oiled hardwood floor is easily cleaned, but dark and unattractive. Tiling is clean, but harder for the feet than linoleum.

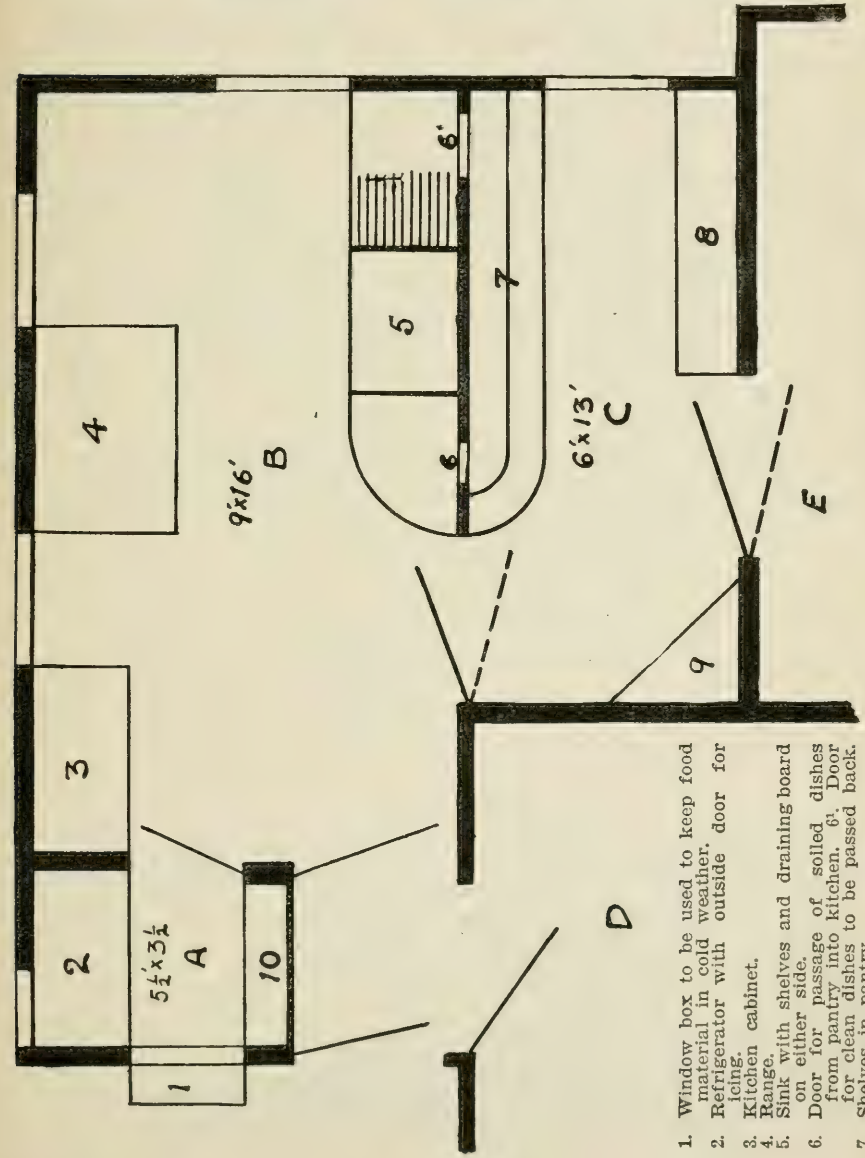
The wall is covered with Sanitas paper in imitation of tiling; it is comparatively cheap, easily cleaned, and attractive looking. It must be carefully hung to have no hiding place for vermin. Metal tiling is more sanitary, but more expensive. It is cheaper, however, than true tiling, and perhaps as satisfactory.

A modern kitchen cabinet with all its conveniences of having working materials at hand is placed where there is good light next to the stove on one hand, and the cold pantry on the other, with the sink at the back.

The stove is well lighted. It is near the kitchen cabinet, the sink, and not far from the dining room door. It is provided with a hood or canopy to carry off the odors of cooking, and the house is further safeguarded from odors by the possibility of a direct draft from the windows across the room between the stove and the other rooms.

The easily cleaned refrigerator, in the conveniently placed cold pantry, has an ice door that can be reached from the outside, saving the kitchen floor the dripping and footprints which generally mark the ice man's path. Outside of the pantry window is a box in which food can be kept cold many months in the year without the use of ice. If well finished and painted the color of the house on the outside, this need not mar the exterior appearance of the house. The shelves in the pantry afford room for storing food materials.

The small table on rollers can be moved into the cold pantry for pastry work, when the kitchen is too hot. It can conveniently find place between the kitchen cabinet and stove when frying or other cooking makes a table at that point convenient. In kitchens where sink and china closets are far apart, such a table saves many steps at dishwashing time. In this kitchen the lowest shelf of the china pantry is convenient for the reception of dirty dishes from the dining room table. Here they can be scraped and piled and passed through the window on to the shelf at the right of the sink.



1. Window box to be used to keep food material in cold weather.
2. Refrigerator with outside door for icing.
3. Kitchen cabinet.
4. Range.
5. Sink with shelves and draining board on either side.
6. Door for passage of soiled dishes from pantry into kitchen. 6^1. Door for clean dishes to be passed back.
7. Shelves in pantry.
8 and 9. Shelves with glass doors.
10. Shelves in cold pantry.

PLAN OF MODEL KITCHEN.
Scale: ¼ in. is 1 ft.
A. Cold pantry. B. Kitchen. C. Butler's pantry. D. Back hall. E. Dining room.

A window at the end of the drain-board gives light for the dish washing and allows, if the view be good, a chance for inspiration during the mechanical work of dish wiping. The window into the cupboard, over the drain-board may be made small, allowing simply for the passage inward of the piles of clean dishes, or may be made large enough to give access to the back of all the shelves in that part of the pantry, allowing each dish to go directly from the dish towel to its place on the pantry shelf. The opening may be closed with glass or wooden doors.

At the farther end of the kitchen is a place for the ironing board near to both stove and windows, but entirely out of the way of other workers in the room. It may be hinged to the wall at one end and folded up into a wall cabinet when not in use. Enclosed shelves below may give place for the irons, holders and wax. The heights of the ironing board, sink and table should be suitable to the height of the worker. A high stool can be used to advantage at the sink and kitchen cabinet. Every kitchen should have at least one comfortable chair. Since at best many hours daily must be spent in the kitchen its arrangements and equipments should be such as to make the work there as easy and as attractive as possible.

Some of the visitors said that the kitchen was too small for a farm, but those who had had experience both in a small, conveniently arranged kitchen and in a large one in which miles must be walked in doing the ordinary day's work, were in favor of the compact arrangement.

THE BREAD MIXER.

Mrs. W. E. White demonstrated the use of the bread mixer, showing that as good bread may be made by its use as by the old hand process, while much time and energy is saved.

THE STEAM COOKER.

Mrs. C. W. Greene showed how a whole dinner could be cooked over one gasoline or gas burner by the use of a steam cooker. She used the Toledo combination roasting oven and steamer, with its dry air oven below and the steam compartment above, both opening by doors at the side.

THE FIRELESS COOKER.

Mrs. M. F. Miller showed an ingeniously home-made fireless cooker. It consisted of an empty soap box filled with straw and covered by a piece of old carpet into which three holes were cut to allow of the sinking into the straw of three kettles of different sizes. Over all was a pillow filled with newspapers. In this she cooked oatmeal over night for breakfast. She started it on the stove at night, then while hot she put it quickly into a hole in the box, covered it closely with the pillow, and in the morning it was well cooked and still hot.

Another home-made, and a store bought fireless cooker were on exhibition. The general principle is the same in all cases. A box is filled with some poor conductor of heat, into this hot food is put in closely covered vessels and allowed to continue cooking with its own heat. Any poor conductor will do. Hay, straw, excelsior, cotton-batting, wool asbestos, wool, crumpled newspapers and feathers have all been used successfully. In addition to a sufficient quantity of poor conducting filling, it is necessary that the box be closely covered and kept shut, and that a large enough volume of hot substance be used. Naturally a small volume cools much more quickly than a large one. If only a small quantity of food is to be cooked, the vessel containing it should be set into a larger one containing enough hot water to maintain the temperature. One of the best ways to cook tough meat is in the fireless cooker. It should be just covered with boiling water and allowed to boil on the stove for ten or fifteen minutes to sear the surface, then while still boiling, tightly cover and put at once into the cooker, with or without more hot water on the outside, according to the volume of the water covering the meat. If the meat should be taken out before it is tender it can be reheated on the stove and put back again. When done, the outer surface can be browned quickly in hot fat and a brown gravy made with the water, so that none of the flavor is lost, or the browning may be done before the long cooking.

HOUSEHOLD ADJUSTMENT TO TECHNICAL DEVELOPMENT.

(Miss Caroline L. Hunt, Professor of Home Economics, University of Wisconsin.)

Improvement in the material conditions of life comes by three stages; the first being marked by the rise of a theory; the second by the invention of a device for applying the theory; the third by the adjustment of human affairs and practices to the use of the device. Theory, practice, adjustment, these are the three stages. For illustrative purposes, we may trace them in that improvement which has been the result of successful warfare against infectious diseases. Diptheria which once annually destroyed a large number of young lives has been practically wiped from the earth. The first stage in this beneficent change came with the development of the theory that the disease was due to the inroads of certain bacteria and to a poison which the bacteria made within the body by their action upon the tissues. The second period saw the discovery of an anti-toxin and the invention of a process for introducing it into the human system. The third was a period of education and adaptation. The date of this third period was so recent that there are probably few present here who cannot look back to its earlier years and bring to mind at least one young person who died, not because the means of cure were unobtainable, but because the physician in attendance had not accepted the newer theories of disease and applied them in his practice. He had not yet entered upon that period of adjustment, which at this time is fortunately about complete. The warfare against tuberculosis, on the other hand, having passed successfully the first and second stages, has halted at the entrance to the third. This delay is due to many causes. One is the fact that the prevention of this particular disease is dependent quite as much upon the enlightenment of a large body of laymen as upon the training of a few physicians and health officers; and the education of the laity is a slow process. Another is the widely accepted belief that the disease is transmitted principally by inheritance, and that the pain and sorrow which it brings are inevitable. A third is the fact that the progress of tuberculosis is without those spectacular and sensational features which attend such maladies as diphtheria and smallpox.

In the coming of those improvements which have for their object the saving of time and energy and the increase of comfort we may trace the same three eras. The possibility of aerial locomotion rests upon a well substantiated theory, but theories even when well substantiated offer uncertain support to those who would fly through the air, and for this reason we have not yet begun to think of tearing up our railway tracks and of sending our locomotives to the junk shop in preparation for adopting the newer methods of travel. The consumption of smoke, on the other hand, has passed the stage of practice as well as that of theory and at present is prevented only by warring human interests from conferring its inestimable benefits upon mankind. These interests offer an effective barrier to its entrance upon the third stage of its progress.

In the improvement of conditions of living through the adoption of new household devices, and of new methods for doing work, we may find the same three steps. Certain schemes are still in the theoretical class. Among these may be noted a very enticing plan for window cleaning advocated in a recent Utopian romance. By this plan, upon the touching of a spring, liquid was to be directed in jets across the window pane and when it had done its work was to be carried off without injury to any of the house furnishings. All this was to be done with no further expenditure of energy upon the part of the housekeeper than that involved in the pressing of a button. This scheme, it is needless to say, has never been put into operation. On the other hand, improvement in household conditions by the removal of the dirt and noise involved in the delivery of coal, the care of fires and the removal of ashes has been shown to be possible, for heat can be delivered to private residences from a central station. That this much-desired change waits merely upon the reconciliation of warring human interests is shown by the fact that in large institutions where there is no conflict of interests because the buyer of coal and the user of the heat are one, central heating plants are employed without question, even for buildings which are widely separated. The central heating plant is but one of a large number of useful appliances which so far as technique is concerned, are within the reach of all housekeepers. It is perfectly possible to send hot water for cleaning as well as for heating purposes from a central station. One town, Colorado Springs, is seriously considering laying pipes for a central pneumatic cleaning plant in the belief that such a device is practicable. This unusual example of progressiveness is probably due to the fact that the dangers from dust in Colorado Springs are so great as to make a peculiarly loud appeal to self-interest. So far as progress is dependent upon knowledge and inventive skill, there is no reason why housewives should not have the benefits of air completely free from dust and soot; why all goods should not be delivered within town limits in electric automobiles and manure banished from the streets; why contractors and builders should not be educated to supply as a matter of course concave baseboards and doors without horizontal ridges for collecting dust, like those in use in good hospitals; why clothes should not be as well laundered in public places as in private basements; why women's exchanges and similar commercial enterprises should not enlarge their usefulness by establishing delivery systems, thus meeting the needs of all housekeepers as well as of a few dependent women. There is no reason why garbage pails should not be sunk in cement compartments near the kitchen door, and why, when full, they should not be removed unopened and replaced by clean and sterilized cans. With no coal to be delivered, no ashes to be carried out, no clothes to be dried, and no garbage pails in sight, back-yards could be transformed into gardenspaces. The small areas at the backs of all the many houses in one block could be united so far as appearance is concerned and treated by a landscape gardener as a whole. Houses could be so planned that living rooms would face on this park. The beauty and the incentive to outdoor life which would result, would immeasurably improve conditions of living. Thus numberless schemes for removing the sources of dirt, for facilitating cleaning processes, for reducing the amount of labor necessary for the preparation of food, and for bringing beauty into life, await merely the adjustment of interests among those who would be most benefited by them.

The first stage in any improvement comes because some man or some woman has a genius for scientific research and investigation and envolves a new idea; the second, because another one person has inventive skill, but the third is due, not to chance accomplishments in individuals, but to certain group characteristics which are of slow development. We have seen that adjustment is quickened by spectacular exhibitions of preventable evils each as plagues and dust storms; that it is retarded by short-sightedness and unenlightened self-interest. We know further from our own experience and observation that it is hastened by education and training which reveal the conditions of the problems of living and disclose their possible solutions; by wide vision which reveals the inter-dependence of different social groups and their opportunities for mutual helpfulness. We know that it is hastened by far as well as wide sight; by a vision which looks back into the past in the light of history and forward into the future in the light of the past, for such vision only shows whether a proposed change is likely to be in line with progress or must be looked upon merely as a temporary measure for relief. The period of adjustment is further hastened by freedom of action, for this is necessary to that experimentation without which advance is impossible; and by unselfishness, for this is necessary for the sacrifice of the temporary advantage of the few to the permanent welfare of the many. Finally, the period of adjustment is hastened if there is within the group a strong organization.

for this furnishes not only the opportunity for united action, but also a satisfactory means of communication between the individual members of the class. It makes it practicable for the group as a whole to test those new devices which can be used only by large numbers of people, and also for all the members to secure the advantages of successful experiments by individuals with new appliances or novel plans of work.

Adjustment to technical development in the affairs of everyday life comes largely through adjustability in a somewhat limited group of people, including housekeepers of the more privileged classes in society. These women are in most respects ready to make the adjustments demanded by the times. They are at present securing advantages of most of the forms of general education that are offered to men. In addition to this, they have worked out for their own use and for the use of those who must in time take their places a satisfactory system of training for their own peculiar work. What women have done for education in domestic science, I need not say. I would, however, take this opportunity to express my appreciation of the value of the work which Missouri women have done in securing the establishment of a department of Home Economics in the University of Missouri, and in persuading boards of education to incorporate cooking and sewing in the curricula of many of the graded schools throughout the State. This work is an evidence of intelligence on the part of the women of Missouri. It is fundamental and is necessary to further progress, for training in household arts and education in domestic science serve to place the conditions of household problems before all women. By means of the formal education of the schools and the informal education which they are securing in their clubs, women are securing also another aid to adjustability, that wide view which shows them their peculiar domestic difficulties in their relation to the larger problems of life. Women who are studying municipal activities, immigration, and the conditions of women and children in factories, no longer see the household labor problem except as a part of the whole industrial complication.

The industrial problem, complicated as it is, may be stated in a few words. In this world there are millions of people with essentially the same needs if not the same felt and expressed wants. They need good food, fresh air, healthful and beautiful clothes and houses and the opportunity for growth in body, in mind, and in aesthetic appreciation. For the satisfaction of these wants the world possesses natural wealth (in wood, in coal, in iron, in scenery); it owns also inherited artificial wealth, good roads, public buildings, and parks, and best of all, perhaps, it has the advantage of human energy and the means of training it for the service of all. And yet in spite of this tremendous mass of wealth, men, women and children starve or die because they eat bad food; freeze to death; suffer for lack of air and of beauty, and frequently miss the opportunity to grow into the physical and moral stature of their greatest usefulness. With a view which is far as well as wide, women, and men also, are learning that the material things with reference to which they stand now in the position of makers or producers, now in the position of buyers; again in the position of users or care-takers, may be the agencies by which other men and women are dwarfed and stunted and handicapped, or may be factors in development and in spiritual and bodily growth. Seeing this they are forming for themselves a new religion whose values are material as well as spiritual.

This new religion instead of displacing and superseding the old, is giving to it a zest and a much-needed earthly setting. Whereas, in the old religion, man sought to get into communication with the unseen by offered prayer and by inspiration received in return, and grew in grace in proportion as he was successful in establishing this communication, so in the newer religion, man seeks a means of communication between himself and his fellows through the medium of those material things which some make for their own destruction or their own development and some use to their own profit or their own loss. He feels that he is on the road to perfection in the practical application of this new faith only when he so uses wealth as to increase it and to secure its equitable distribution. Under the influence of the newer creed old evils assume new relative proportions and old sins appear in new guises. Now inherited wealth is no excuse for failing to contribute to the general store from which one must necessarily take. Now with our knowledge of the world's needs, of its need of better food and cleaner air, of more parks and schools and libraries and playgrounds and art products, we realize that it may be a sin to insist unnecessarily upon having a given piece of work done by one method when it could be done as well by another process with less expenditure of energy. If the time-consuming way of doing work is necessary for the training of the hands, for relaxation after mental labor or for the beauty of the product, it is not unnecessary. This, of course, is not the opportunity to present the relative advantage of hand and machine labor or of work done on large and on small scales. The point that I wish to make is that the *use of real labor-saving devices and the employment of co-operative methods of production may be a sacred duty in a world of many needs.*

But the view must be far in time as well as wide in space if it is to be a factor in progressiveness and adjustability. Women who know the history of the past and who understand the conditions of the present see tendencies in society which make them realize that the final solution of the industrial problem will be upon a democratic basis. Industrial democracy, like the labor problem, may be simply stated, in spite of the tremendous practical difficulties which it suggests. That within the limits of the well-being of society as a whole every individual should have an opportunity to secure training for the work he is best fitted to perform, should have an opportunity to contribute to wealth, and the privilege of disposing of the rewards of his labor according to his own desires, is perfectly self-evident; and since we accept this we must accept also the fact that household labor will not be brought into line with progress toward industrial democracy until the workers receive the full money value of their work and are permitted to decide for themselves what per cent. they will use for food, what for clothes, what for shelter, what for education and what for the higher life, to use Mrs. Richards' classification.

The wide view and the far view show that the experiments which we most need and those whose results should be brought most clearly to the attention of all women, are those which have for their purpose the reduction of the amount of unproductive labor and the placing of household work where it will be in line with the development of democracy. In making such experiments, women are seriously handicapped in two ways: First, by economic dependence which frequently prevents them from controlling the wealth which they produce, and, second, by the fact that they have no vote upon municipal affairs. The woman who receives in exchange for her labor only food and shelter and the opportunity to run up a bill at the dry-goods store may, because of her force of character and intellectual strength be a factor in household adjustment to technical development, but she can never be so great a factor as she would be if she could control her income. The woman who is obliged to work for public improvement by the indirect methods of persuasion and argument is at a disadvantage in trying to introduce up-to-date methods into town administration, and into municipal housekeeping. Every move that is made toward securing economic independence of women and their opportunity to express by means of the ballot their opinions upon matters which vitally concern their own welfare, and that of those for whom they are responsible, is a move toward the solution of the domestic labor problem.

Experiments in adjustment may inconvenience some women very much, particularly those from whom a happy fate has warded off difficulties in domestic service. For this reason the present situation would seem to call for a new kind of unselfishness. We have all known of women who apparently grew in grace and in beauty of character through the acceptance and cheerful performance of homely, monotonous tasks. But if we analyze the situation, we discover that the acceptance of such work was simply an evidence of intelligence, and was due to the fact that the women saw some very important ends which they could gain only in this way. We see also that their growth in grace was due to the discipline which comes from a cheerful acceptance of the inevitable. The homeliness and the monotony of work were not in themselves factors in the development of character. If better conditions of living for all wait at present, not so much upon the acceptance of drudgery as upon the willingness to enter upon untried ways, it may be that the latter will be a road to real unselfishness.

Successful attempts by individual women or by communities to make use of labor-saving appliances should be speedily brought to the attention of all women and all communities. For this purpose there must be a perfect system of inter-communication among those most interested. It happens that almost by accident women have worked out a nearly perfect plan for intercourse among themselves. Individual members of clubs, the clubs themselves, district and State federations, and the national organization form a perfect network through which information may be sent either out from the center to individual members or from individual members to the center. This means of communication is being used very largely at present, particularly by those who are interested in social reform. It is strange that it is not more frequently employed by women for the accomplishment of work which is peculiarly theirs. There is certainly no reason why if one woman discovers a helpful device she should not have a chance to make her good fortune known to all; why if the women of one town succeed in doing co-operatively a work which benefits the entire community; if they succeed, for example, in working out a satisfactory method for delivering cooked food to private houses or of conducting a public laundry, the details of the work should not be made available for all women, and for all towns.

The strength of our organizations should be used for the purpose of securing better household goods. Manufacturers and dealers, actuated by a desire for profit, are bombarding us with multitudinous articles of the same general character, differing only in name, with appliances which have not stood the test of experience, with fabrics whose wearing power has not been proved. Before this fusilade of articles the individual housekeeper is powerless. The forces of commerce by dealing with us separately, conquer us. It is for us to display a solid front by organizing as consumers and by collecting and distributing information. We have stood helpless long enough and have received what has been offered to us. The time has come for us to say what we want and to use our means of intercourse and our organizations to secure it. We must enter actively into commercial life as consumers with our united influences.

Women must share the responsibility for all those conspicuous forms of waste in industrial life which divert human energy from the creation of wealth. They are in part responsible for the waste involved in those forms of toil which are uneducative and which render the worker less and not better prepared for future labor. That the employment of children in institutions where activities have neither educational purposes nor educational value comes under this head, I need not say. Women are partly responsible also for all that diversion of energy from useful pursuits which is the result of the effort to make fabrics look like something which they are not and for a large amount of sewing made necessary because these fabrics wear out before their time; they are responsible to a large extent for the appalling waste of precious human life in the advertising business which creates no wealth, raises no food, builds no houses, makes no clothes, but merely affects a distribution of wealth which is to the advantage, not of society at large, but of a few individuals. Instead of making wealth, this form of activities frequently destroys it by defacing natural beauties and disfiguring towns. I do not speak of those legitimate forms of advertising which show where useful commodities may be bought, but of those wasteful forms that merely determine which one of two equally poor grades of goods shall be sold. If we could stop the tremendous diversion of energy from productive activities to useless pursuits, we should have plenty to use in experimenting in the new ways of living which the times seem to demand, and for which we are prepared as far as mechanical devices are concerned. We can stop this waste only by co-operative action.

The difficulties of the present domestic service situation are sufficiently spectacular and sensational to encourage women to experiment with the use of new kinds of apparatus, to reorganize their households, and to make renewed efforts to remove their social and political disabilities. The crisis finds them provided with the means for co-operation and for the establishment of bureaus of information. These means, if fully utilized, should shorten the period of household adjustment to technical development, which is the third and last stage in the improvement of the material conditions of household labor.

SOME ASPECTS OF HOME SANITATION.

Dr. Walter McNab. Miller, Professor of Pathology and Bacteriology at the University of Missouri, spoke on the responsibility of the home in the prevention of the spread of tuberculosis and typhoid fever.

He emphasized the care of the water supply, that it receive no leachings from privies or cesspools; the care of the food supply, that it be protected from dirty-footed flies and dust from dirty places; the care of the milk supply, that it come from healthy cows, (which should be submitted to the tuberculin test for tuberculosis) and be handled carefully from cow to consumer by clean persons.

He spoke of the need of sterilizing the sputum and all other discharges of tuberculous patients, and from the bowels of typhoid patients, and of sterilizing everything that came in contact with these discharges. He also emphasized the fact that a person recovering from typhoid fever often carried the germs around in his intestines and urinary bladder for a long time afterwards, even for years, thus continuing to be a source of danger to the community.

Fresh air, sunshine, absolute cleanliness, and a continuous warfare against flies, mosquitoes and other insects, are the chief means at our disposal for the prevention of the dissemination of the infectious diseases.

THE PURE MILK PROBLEM.

(Mrs. Walter McNab Miller, Chairman National Pure Food Committee, Columbia, Mo.)

Dr. Charles Harrington, Secretary of State Board of Health of Massachusetts, has pointed out the fact that one of the most serious problems confronting both economists and sanitarians is the enormous mortality of infants below the age of one year. In Germany one-fifth of those born die in the first year; in England one-tenth die, while in America so far as we can judge from the small registration area, the per cent. of deaths varies from 12 1-2 to 25. But this is only part of the story.

Of this number, 5.3 per cent. of those who die are nursed by the mother, 6 per cent. are fed on certified milk, or goat's milk, while the mortality of those who are fed on ordinary market milk reaches the enormous rate of 88.7 per cent. Nor does the mischief end here. I quote from the last number of the Medical News; "According to the last report of the Medical Officer of the London County Council, the adverse environment which slaughters one in five of the infants born in larger cities has a maiming effect on those left." There has been a tendency to look on a high death rate of infants as a natural process of weeding out the unfit, leaving the strong ones to survive in order to propagate a hardy race. This view can no longer be held, as experience has shown that many of the survivors are liable to develop into weaklings and frequently to become the progenitors of useless children." Here is the subject of race suicide viewed from a new standpoint.' Now in this question of a bad milk supply, the use of preservatives plays a strong part—not alone because they are injurious in themselves, but also because by use, their unclean methods of taking and handling the milk are covered. There have been scientists—notably Behring of Marburg—who have advocated the use of formaldehyde in milk, but the weight of authority is distinctly against the use of this or any other preservative. Professor Schlossman of Dresden who, by virtue of his position as physician to a large childrens' hospital, and through a carefully conducted series of experiments on children's milk, is in a position to know, writes thus in the Archiv fur Kinderheilkunde—"The addition of formaldehyde to milk changes the cream essentially in its chemical nature, the milk albumin is wholly altered in that it loses its ability to coagulate, while the fat is so affected that in certain mediums it will not dissolve." He also combats Behring's theory that sterilized milk is more injurious than milk treated with formalin, by proving from his experiments that formalin, by the very preventing of the souring of the milk, is itself a menace, as these bacteria of lactic acid inhibit the growth of pathogenic bacteria, such as tuberculosis, scarlet fever and diptheria. His conclusion is that *heat* and *cold* are the only permissible mediums for the preserving of milk, and most authorities bear out this statement. But even more serious than the use of preservatives is the proved fact that most of the market milk is so filthy that its use by an infant is fraught with great danger. This dirt reaches the milk from dust in stables, from the cow, from milkers, from dirty receptacles, from flies or from water supply; and tuberculosis, scarlet and typhoid fevers and infection from pus of cows having garget, are the main diseases communicated by means of this unclean milk. In this connection I would urge everyone to read circular No. 118, "The Unsuspected but Dangerously Tuberculous Cow," issued by the U. S. Department of Agriculture, and "The Tuberculin Test for Missouri Cattle," by Dr. D. F. Luckey, our State Veterinarian, which give, in detail, information most important for every housewife to know.

For the past few years there has been a widespread agitation for honest labeling and clean food, but so far the efforts have been mainly directed toward securing needed legislative action. Now comes the time for active personal work, and here the story of the Model Milk Supply of Copenhagen serves to point a moral and adorn a tale.

In 1878, Mr. Busck was struck with the fact that one of his workmen was refused milk at a distillery where cows were kept, on the ground that "He didn't buy his spirits there." Investigating the matter, Mr. Busck found that there was in Denmark, absolutely no control over the cattle, the farm laborers or the adulteration or contamination of milk. With a clearness of vision given to few, he saw here a splendid opportunity for supplying the city with a real necessity, and that, viewed either from a philanthropic or a commercial point of view, the effort was well worth his while. He at once enlisted the sympathy of one of the highest medical authorities in Denmark, Professor Pamum, Herr Belle—at one time the Minister to this country, Dr. Borch, and several other prominent men, three of whom agreed to form an independent commission, working without remuneration and with no monetary interest in the concern. It was decided that any profits exceeding 5 per cent, payable to shareholders, should go toward reducing the price of milk and improving the business generally—that the following regulations should be enforced.

Every cow on the farm of this Association was to be subjected to a fortnightly inspection by a veterinary surgeon, who was to report on cleanliness, quality of feeding and general treatment as well as on any disease from which the animal might be suffering. The farmers were to cool the milk immediately after milking to 41 degrees F., and it must have a temperature not more than 50 degrees F., when it reached Copenhagen or it was rejected, and to provide for this 30 lbs. of ice were to be kept in stock for every 11 gallons of milk produced.

After it arrived in Copenhagen, the milk was all sampled and tested chemically and bacteriologically filtered, run off and bottled, but even then the care did not cease. The milk carts were so constructed that there could be no tampering with the milk, as every can and every barn door was sealed and the cans then covered by ice in hot weather. Every milkman was in uniform, and the trade mark of the Association, a red and white clover blossom with green leaf on a black rectangle painted on a white ground, was on every van.

The skimmed milk was sold at a very low price, and was a Godsend to the poor who recognize what our people seem to forget, that skimmed milk is the most nourishing article of food that can possibly be obtained for the price for which it can be sold, 2 1-2 cents per quart.

Two other facts are of especial worth in this Association; the farmers were bound by their contract to report *at once any* case of sickness among either herd or workmen, and to refrain from using milk from a suspected cow and to isolate any workman who might be ill or have sickness in his family.

In return for this, the Association agreed to pay full price for all such milk and full wages to the workman while he laid off, so that there was absolutely no reason for deception. In addition to all this, there were regular dairy maid inspectors who supplemented the work of the veterinarian and medical inspectors, who looked after the health of the employed.

Yes, ideal, I hear you say, but does not all this so increase the cost that the price of milk is beyond the average customer, as it is with some certified dairy milk in this country?

In Copenhagen today, whole milk brings 20 cents per gallon; infants' milk brings 25 cents per gallon; half skimmed milk 10 cents per gallon; cream, No. 1, $1.25 per gallon; and cream No. 2, 75 cents per gallon, but it would be impossible to duplicate these prices in this country unless the business was conducted as a charity. But even at double the present price, milk would be a cheap food, and when we count the enormous cost of doctors' bills and funeral expenses, to say nothing of the sad hearts and empty homes resulting from the use of polluted milk, who would question the wisdom of paying for the safe-guarding of human life?

The demand for clean milk must come from the women, and the Pure Food Committee of the General Federation of Women's Clubs is concentrating its efforts on (a) the improvement of the milk supply, (b) the improvement in the sanitary conditions in markets and provision stores. As chairman of this committee, it will be my pleasure to send literature to anyone interested in this matter or to answer any questions as to our method of work. That this Housekeepers' Association will grow and be a power for good in our State, I firmly believe, and together we can accomplish whatever we desire; and one of our first objects should be the securing for our families and ourselves a clean, safe food supply.

THE REVIVAL OF MISSOURI HANDICRAFTS.

(Mrs. F. H. Seares, Columbia, Mo.)

It is not because skilled handicraft has entirely died out of Missouri, that a revival of interest in it has arisen. There is on the contrary a remarkable tenacity of life shown by such handwork as basketry, chair-making and the weaving of carpets on hand-looms. These industries, brought to Missouri by the pioneers of the State, have not only out-lived the introduction of the corresponding machine-made articles, but strongly exemplify the natural tendency of the people to make the most of the material at hand and to guard against waste.

Upon this excellent, and already existing foundation, then, there is an unusual opportunity for the growth of profitable and interesting handicrafts; these, if aided by proper training, will give not only an added income to those who cannot do the hardest labor of the farm, but also prove a source of real pleasure to the educated portion of the country population. The farmer's daughter, returning home from college or university will find no happier outlet for the ambitions of her trained mind than the planning of better color schemes for the weavers in her neighborhood, or the making of excellently designed native baskets. Here is a field in which the modern art education may find an opportunity for undoubted usefulness. The results of such an application of the principles of art to the homely industries will be twofold. Individuals will enjoy the gratification which comes from the creation of a work of art, and communities will be educated to discard cheap, gaudy articles made by machinery, simply to sell, and will cling to and develop their own original artistic handicraft with its superior wearing qualities.

The Boone County Handicraft Exchange at Columbia aims to establish an added line of communication between the university and the farm, and thereby to serve the double purpose of giving to skilled workers such simple rules of design, as will enable them to reach a better market, and to furnish to buyers of taste well-designed articles at a reasonable price.

THE PRESENT CRISIS OF THE AMERICAN HOME.

(Charles A. Ellwood, Professor of Sociology, University of Missouri.)

Professor Ellwood, in opening his address, called attention to the fact that the home, or rather the family, is the most important institution of human society. It is the function of the family in society to conserve all social possessions and hand them down to the next generation; not only are the material possessions thus preserved, but also the spiritual possessions of the race—language, religion, morality, art, government and ideals. The family thus preserves the social continuity from one generation to another; it not only reproduces the individuals of each generation, but it also reproduces society itself. Moreover, in the relations of the members of the family to each other, we have the source of altruism, upon which society depends for each upward advance. Hence, moral progress in society rests upon the family life. Christianity, itself, indeed, is but an idealization of the family life. "Family affection, in some form is the indispensable root of Christianity." The home, therefore, charged with the task of bringing new individuals into the world, socializing them and furnishing them with their ideals of brotherhood and service, is by far the most important institution of society—church and State sinking into insignificance when compared with it.

The problem of the American home is not the making of certain re-arrangements in the household, but unfortunately, it is whether that home shall continue to exist. The instability of American family life has become so great that we not only lead all civilized countries in the number of our divorces, but we have more divorces than all the rest of the civilized world put together. In 1885, when we had 23,472 divorces in the United States, England had but 508, France 6,245, Germany 6,161. Later statistics show even greater discrepancy. In 1900, when Great Britain had but 728, France 7,157, and Germany 8,000, we had over 50,000 divorces in the United States. Moreover, divorces in the United States are increasing more than two and one-half times as fast as the population is increasing. In 1867, when divorce statistics first began to be kept, there were 9,587 divorces in the United States, and by 1886 the number had increased to 25,535, an increase of 157 per cent., while in the meantime, the population had increased only 60 per cent. In that twenty years, 1867-1886, there had been granted a total of 328,716 divorces; but in the twenty years following, 1887-1906, the statistics of which are now tabulated by the Census Bureau, the number of divorces granted in the United States increased to the enormous total of nearly 1,000,000, rising from 25,000 in 1886 to about 65,000 in 1906. This was an increase again of over 150 per cent., while the population increased less than 50 per cent. In 1870, 3.5 per cent. of all marriages were terminated by divorce; in 1880, 4.8 per cent.; in 1886, 6.2 per cent., while now it is estimated 10 per cent. of all marriages in the United States are terminated by divorce. Should divorce continue to increase in the United States at the present rate, by 1950 one-fourth of all marriages will be terminated by divorce, and by 1990, one-half. It is evident that the real problem of the American home is whether it shall continue to exist.

Moreover, in certain communities in the United States the conditions which we can foresee for the whole country a half century hence, if present tendencies continue, have actually been approximated. In Indiana, in 1900, there was one divorce to every six marriages; in Maine, in 1902, one divorce to every six marriages; in California, in 1905, one divorce to every seven marriages. Moreover, this condition is not remote from us. While the divorce rate in Missouri seems to be about one divorce to every twelve marriages, in Kansas City, in 1903, according to the United States Census, there was one divorce to every four marriages, while in San Francisco there was one divorce to every three marriages.

When we examine the classes in our society, among whom divorce especially prevails, the causes for the widespread instability of American family life begin to appear. We notice, first of all, that divorce is four times as common among childless couples as among those that have children. The child in all ages has been the center of gravitation in the family life, and the chief bond between the parents. A childless home is abortive, incomplete and necessarily unstable. About 20 per cent. of American marriages now result in no children and these childless couples are especially apt to become divorced. Again, divorce is from one and one-half to two times more prevalent in the cities than in their surrounding country districts. This is due, without doubt, to the "homelessness" of city populations, the mass of the people often living in boarding houses, apartment houses and tenements. The American home has always flourished best in the country, but in the United States, at present, the cities are growing in population about three times as fast as the country districts. Again, divorce is not an evil which the foreign-born and the negro have brought to us, for it especially characterizes the native white—that is, the pre-eminently American element in the population. It is about twice as high among the native whites as among the foreign-born. This leads one to suspect that divorce has something to do with the individualism of the American people, the tendency among us for each one to do as he pleases, to be a law unto himself. This is borne out by the fact that in those sections of the country in which individualism is most highly developed, the divorce rate is highest, namely, in the New England states and the Western states. It is also borne out by the fact that divorce is more than four times as common among Protestants as among Catholics. The Protestant element in the population is the element in which individualism is more highly developed; besides, the Roman Catholic church refuses to sanction absolute divorce upon any ground. Finally, two-thirds of all divorces are granted upon demand of the wife. This suggests that the standards of morality of the male element of the population are not what they should be, and that husbands too often give ground for divorce by immoral conduct. Higher standards of morality are necessary as civilization advances, and conduct which the wife overlooked in the husband a half century ago, or bore in silence, now becomes a ground for divorce. This last statement suggests another cause for increasing divorce in this country, and that is the emancipation of woman. Woman has now equal rights with man, and has achieved her economic, intellectual and moral, as well as legal, independence of man. This has been a good thing in itself, but many women have used their freedom to emphasize their rights rather than their duties, and consequently have rendered the family life less stable. In so far as the movement for "woman's rights" has been simply an expression of growing individualism or selfishness on the part of our women, it has tended, like all individualism, to destroy the home.

If the one million divorces in the country during the last twenty years had been granted for trivial causes, the divorce movement would be serious enough. But it is infinitely more serious when the separations take place for grave moral reasons. It is generally recognized that such causes as adultery, desertion, cruelty, imprisonment for crime, habitual drunkenness, and neglect to provide are grave reasons for divorce; and while some of our states have omnibus clauses in their divorce laws, these six principal grounds are the ones recognized by the majority of states. Moreover, the statistics of divorces granted show that 97 per cent. of all divorces are granted on these six principal grounds. Only an insignificant fraction of the divorces in the United States are granted for trivial reasons, such as "incompatibility of temper." Again, over 60 per cent., or nearly two-thirds, of the divorces in the United States are granted for the two most serious grounds of all—adultery and desertion. In other words, in two-thirds of the cases, divorce was granted after husband and wife were already practically separated. We must conclude, therefore, that divorce is prevalent, not because of the laxity of our laws, but rather because of the decay of our family life. The real evil is not divorce, but the decay of the very virtues upon which the home rests. The crisis in American home life is whether we are able to build up the virtues upon which a new and higher type of family life may be built—higher, that is, than the despotic semi-patriarchal type of family of our fathers which is now passing away, or is rather already extinct. It must be remembered, however, that the first essential element in the home life of a people is stability.

It is evident, I think, that laws can do but little to check the decay of our family life. Legislation, it is true, can do something to mitigate the grosser evils, and to set moral standards. Here in Missouri our laws have certainly been too lax. We should reduce our eleven grounds for absolute divorce to two or three, leaving the other grounds now recognized as simply grounds for legal separation. We should prohibit remarriage after the divorce has been secured, at least to the guilty party, for a reasonable time for the sake of public decency. Perhaps a uniform Federal divorce and marriage law enacted by the Federal Congress, if the Federal Constitution could be amended to permit such a thing, would help somewhat.

But it is evident that in relaying the foundations for a stable family life in our country, main reliance must be placed upon education, rather than upon legislation. This education must be given in the school, in the church and in the home itself. In the school, children can be taught the sacredness of the family life, and the function of the family in social order, the importance of a pure and wholesome family life as the foundation of a nation's greatness. Again, in the school, the children can be taught the sciences and arts upon which a wholesome home life rests upon its material side. The movement to establish the teaching of domestic science or home economics in our public schools is a salutary one. The church, and especially the Protestant church, has not done its full duty by the home in the past. It should devote more time to teaching the ethical ideals of Jesus concerning the family life, both in the Sunday school and in the pulpit. Finally, the home itself must teach the young the sacredness of the family. Boys should be taught the same standards of morality as girls; and both should be taught to look upon marriage and the family, not as an indulgence, or as simply a means to personal happiness, but rather as a means to a wholesome, unselfish, and noble human life.

THE HOME.

A BUSINESS PROPOSITION.

(Mrs. Emma Page Tracy, Chillicothe, Mo.)

History tells us how the first man was banished from home, and how Eve (through loyalty to him) went also; thus keeping intact the home life, of which, and to which, woman was merely subordinate until about 2,000 years ago, when the salvation of the world being made possible through woman, her sphere was recognized and the education of her talents began. We see from this why the foundation of the home is religious sentiment—how it is the outcome of the elements of revelation that influence the will of man and compel him to subordinate brute force to the ideals of honor and of love.

The evolution of life brings us to the 20th century business problems, the most important being the necessary skill and art to meet the two great foes of our race—hunger and cold.

The secrets necessary to combat these two forces must be known to the house-wife of every successful home.

A misfortune of mankind is that matrimony is the only vocation for which candidates have no training. Yet it is the one that should have the most careful preparation.

Before a man makes love to a woman with the intention of asking her to become his wife, and before a woman accepts his offer of matrimony, both should be intelligently trained for the noble vocation of home-making. Girls should be told that their destiny is to be wives and mothers, and boys should be prepared to be good husbands and fathers.

The founding of a home is the beginning of a co-partnership that should exist through life—not being limited, and obligations equal. The partners have but to thoroughly understand conditions, and each one attend to his own branch of the business.

The farm, the profession, the capital invested in business, the skill or the muscle, are the basis from which the revenue is derived to finance this co-partnership known as the Home. The day laborer, working for $1.25 per day, 300 days in the year, represents an investment at 6 per cent. (the legal rate of interest) of $6,250.00. The professional man getting $1,200.00 a year, represents an investment of $20,000.00, while a farmer with 160 acres of land, at $50.00 per acre, all his own, represents an investment of $8,000.00 in land, plus his skill and muscle. These various investments represent the source of supplies to be used by the other partner (the house-keeper).

The husband must be in close touch with the investment, in order that the various demands of the Home may be intelligently met and provided for.

It would be well for every housewife, as well as every husband, to keep a set of books. It will take but little time, and the wonders that it will reveal to a wife and mother are manifold. I would suggest for the town home an account something after this plan—an account book (about 6 by 8 inches), and arranged as follows: At the top of the page or pages set aside for rent (or interest on the investment), write *rent,* and so on, for lights, food, incidental expenses, help, husband's expense, wife's, children's (each child separate).

Prices fluctuate but each year adds knowledge, and if the housewife be as thoroughly determined to succeed as her husband is, their ship-of-state will sail into the placid port of peace and comfort.

For the farmer's wife, the same kind of book will do, and the arrangement would be the same, only to be honest with herself and the business firm, she must keep an account of all butter, eggs, poultry, meat, milk and cream, fruit and vegetables raised on the farm and used in the family, at the selling market price. These accounts should be balanced at the end of each month, and at the end of the year both members of this co-partnership should settle up the books of the firm. It sounds like work, but I assure you that you will not find it such.

The most kind thing a mother can do for her daughter is to place in her hands, at ten years of age, an account book, and require from her a statement each month, and a total at the end of the year. She will think by the end of the first year that she has cost something, at least.

"One good mother is worth a hundred school masters." Teach the children to respect money and the methods of *right* getting; to value it as the means to an end. In this, as in all things of life, example will do more than precept.

You have doubtless heard that "as a man eateth, so is he." Well, when all women will have learned that the best "skin food" is good cooking, we will hear less chatter about garnished tables, and ribbons and flowers, among which it is hard to find a mouthful of the right food, rightly cooked, which comforteth the soul.

Ruskin says: "Cookery means the knowledge of Circe and Medea and of Calupso and Helen, and of Rebeckah, and all the queens of Sheba." It means the knowledge of all fruits, herbs, balms and spices, and all that is healing and sweet in field and grove, and savory in meats. It means carefulness, inventiveness, watchfulness, willingness, and readiness of appliance. It means the economy of your great-grandmother, the science of modern chemists. It means much tasting, and *no* wasting. It means English thoroughness, French art, and Arabian hospitality. It means in fine that you are to be perfectly and always ladies (loaf-givers), and are to see that everyone has something nice to eat.

A nation's progress in civilization is often measured by its advancement in the culinary art. Good cooking is not the result of accident or a species of luck. There is reason for every process. A course of medical lectures does not make a physician, nor will a collection of choice recipes make a cook. There must be knowledge of compounding, as well as compiling, of baking as well as mixing, and above all, one must engage in the *real doing*—theory alone will not suffice. Experience which practice only can give is of utmost importance.

If, then, housewives would study from the elementary fact regarding food and nutrition to more advanced cooking, they would imbue the work with an enthusiasm which an insight into its mysteries is bound to inspire, and the reward will be ample.

How accomplish this? The market man, the gardener and the housewife should have frequent conferences to the end that the family be better fed. Not until man became versed in the art of agriculture was it possible to make great advance in cookery, since the product of the vegetable kingdom required higher development before it offered inducements for the experiments of the cook; nor do the most skillful efforts of the farmer avail, unless the cook handles his product with equal intelligence.

Count Rumford says: "The number of inhabitants that can be supported in a country depends as much upon the art of cooking as upon that of agriculture; both arts belong to civilization." Thus the thrifty housewife must be versed in the vegetable kingdom. Ignorance of valuable foods is the result of habit. We do not like certain foods. The truth is, we do not know how to cook them so that they will be palatable.

By a comparison of the different nations and classes of society, we find that meat-eating is not essential to strength, and that the very poor depend upon vegetable food, because it is cheap. Between the farmer and the market-man certain customs have grown up which are calculated to foster ignorance, and against which the protests of the intelligent housewife avail little.

The public must be educated to appreciate quality, rather than size; and that gain in size usually means a corresponding loss in flavor.

The arithmetic of the market gardener should be no mystery to the housewife. She should *know* when things are at their best, should know how to detect adulterations. The housewife who knows so little of values (as a New Jersey housewife recently reported by the United States Department of Agriculture, who spent 14.8 per cent. of the whole amount for food, for oranges and celery, which furnished but 1.4 per cent. total food value) must not be copied by the Missouri housewife.

To the home garden we must look for the luxuries in the vegetable line. The best land is none too good for the garden. It should be near the house, and each member of the family should spend odd minutes giving cultivation to the plants and receiving fresh air—more outdoor work for women would add immensely to the comfort of the family. The garden should be planted as carefully as one would select a library. Many professional men would save doctor's bills as well as grocer's bills by cultivating a garden. Why wonder at the impossibility of getting the poor out of the cities when all education is away from Mother Earth? Mayor Pingree, of my native city, saw the root of the matter and started the potato gardens.

The government holds schools for the farmer and the teacher. Why not for the housewife?

The present need of this country is that every child should be taught the value of a dollar; should learn how to get one hundred cents in value for every dollar spent. Housekeepers do not need so much the instruction how to earn as how to spend an income, especially a small one.

Until recently few women have had any opportunity to learn how to use money wisely. A woman who has once earned her own living, or has had some experience in business affairs, will conduct her household in a very different manner from the one who has had no such training. Thus it is plain that much education is required to successfully conduct this business enterprise.

Most of the friction in daily life of the home comes from the lack of ability to see real conditions.

The bargain sales of shoddy stuffs, rickety furniture, tawdry tableware and cheap cooking utensils would not exist if women were better educated in the laws of daily living. Our purchases are regulated largely by the whim of the moment. The well-to-do women have a tremendous responsibility in adjusting household economics, because their influence reaches both ways—on one hand to the sister who must practice the most rigid economy, and on the other to the home where lavish expenditure is possible.

Lack of generalship is one of the causes of the present chaotic condition of many households, and it is not possible to be different until housekeepers are better educated. No one is fit to direct the household machinery who is not familiar with its details in all directions. A housekeeper must be able to adapt herself to conditions which face her, and which will be different from any other home.

To help the women of our land (nearly half of whom are toiling in the homes on the farms), is the thing to do—for whatever is effective in raising the grade of home life on the farm, in securing the better nourishment and in surrounding them with the refinement and attractions of a well-ordered home, will contribute alike to the mutual prosperity of this country and the general welfare of the farmer.

The Agricultural and Home Economics Departments of this University should go hand in hand in definite enterprises that will give mutual assistance to the vast army of faithful women who are bearing the heavy burden of keeping the farmers' homes pure and sweet, and who are rearing the future masters of our vast agricultural State.

The recognition of an equal responsibility and interest in the family welfare involved in her position of housekeeper means much. It represents to her the difference between an automaton and an individual. It is the expression of individuality in a sphere which is peculiarly woman's.

THE CARE OF THE BABE.

Mrs. Chas. W. Greene emphasized the great value of regularity in giving the baby its bath, exercise, food, and sleep. She told of scientific experiments to prove that sleep in a dark, quiet place is more restful than in a light, noisy one. She showed some baby clothes which could be easily put on and taken off, and told of many little ways in which discomfort to the baby could be avoided and opportunity given for healthy development.

APPLICATION OF KINDERGARTEN IDEAS TO THE AMUSEMENT OF CHILDREN IN THE HOME.

Mrs. John S. Ankeney, Jr., told how it was possible for a mother to invent and adapt many games for her children that would easily instruct as well as amuse them.

THE WOMAN WHO SPENDS.

Miss Bertha M. Terrill, of Chicago, spoke on the necessity for the training of women who are to spend for the family its income. She emphasized the fact that it requires as much skill to so spend this income that the maximum amount of satisfaction and development of family interests may result, as it does to earn the money to be so spent.

In the olden days most of the things used in the home were produced at home and the housekeeper's chief work was that of production. Now most of the things produced by the man of the family are sold for money, and his wife, instead of spending her energy in helping him in production is commissioned to spend this money for the necessities and comforts of the home. It takes no small knowledge of food stuffs, dry goods, and house furnishings, to say nothing of the ways of the market, to be able to buy wisely. And in addition to all this, it is necessary to have a symmetrical idea of family needs that one interest may not be cultivated to the exclusion of others necessary to the all-round development of every member of the family.

This knowledge is not born in woman. Is it best that they should gain it all in the slow, expensive school of experience?

THE HOME ECONOMICS MOVEMENT.

(H. J. Waters, Dean of the College of Agriculture and Director of the Experiment Station, Columbia).

We have not yet realized the full meaning of this Home Economics movement. The first thought associates it with the idea of teaching young women how to become cooks, seamstresses and housekeepers, and this conception of it found expression in the name which was first attached to the movement, "Household Economics." I am pleased to note that Miss Day does not employ that title here, but calls it the Department of Home Economics, or the economics of home building. This means that the home is vitally concerned in the development of this subject and in the outcome of this convention. You call this a housekeepers' conference. My notion is that you would do well to call it a conference of home-makers.

We are not so much concerned in how this or that article of food shall be cooked, but how the human race shall be fed so that they may have what the ancients dreamed of—a strong mind in a sound body. We have spent hundreds of thousands of dollars, and many years of patient toil in determining how best to feed and house and manage our horses and cattle and sheep and hogs, that they may continue in good health and strength, and have well-developed bodies and perform their normal functions. The good, sound literature on these subjects in our libraries will be represented by shelf-fuls, while the literature of this character in relation to the feeding of the human race, and the housing and the nourishing of our children that they may grow into strong and useful men and women, could be carried under one arm. So interested have we been in the accumulation of wealth that we have permitted the welfare of our domestic animals to supplant in our interest the welfare of our children. The home economics movement seeks to remedy this unnatural and illogical situation and to stimulate investigations and researches that shall put the feeding of the human race upon a rational and scientific basis, as is the feeding of our farm animals.

You, who are engaged in this work, however, have a larger responsibility than this. From one point of view we might say that we are not interested in a rational system of feeding the human race; that improper nourishment will have advantages in weeding out the weak and leave only the strong to reach manhood and womanhood. Be this as it may, the future of the home itself is involved in this enterprise. The tendency of the age that appalls me most, is that of the strong women to leave the home and seek some occupation, and live in another sphere. This is primarily because the home, as it is now organized, does not appeal to the intellect of these women, but is considered to be a drudgery, and that in leaving it they are escaping the humdrum existence which it involves. The building and managing of a home must be made to appeal to the intelligence and imagination of these strong women, that our homes may be enriched by their presence, rather than be impoverished by their absence. Take out of these homes the top stratum intellectually, and the average must be immediately lowered. There is certainly enough in the management of homes and grounds, and in the rearing and guiding of children to employ the best talent of the most intellectual, if the whole could be reduced to some scientific basis and stripped of its present chaos.

Another feature of this work that appeals strongly to me is its influence upon rural life. The trend from the farm to the city, which we so lament as a recent tendency, is as old as civilization itself. It may be more characteristic of this age than of any that has preceded, and, if so, it is because the strong and attractive women of the country will not marry men who are engaged in farming, or who contemplate entering this occupation. This means that the strongest of our young men will be forced into the cities, or else forced to marry girls of mediocre ability. The effect in either case is to fix rural life upon a lower plane, and to affect vitally the class of people who are to grow up on our farms. In the past the great cities have been kept alive and progressive by the best blood of the country. But this cannot continue, if those of the highest intelligence are to leave the farm early in life. The home economic's work must play an important part, then, in the development of the farm home in making it attractive to the best women of the country, so that the farm-holder is not handicapped in a matrimonial way, and so that in the future, as in the past, the most virile and effective people of the world will be born on the farm.

After all, then, the home economics' movement lies at the very base of our civilization and of our social life, and deserves to be speedily enlarged and developed to meet this great responsibility. Instead of a department, crowded into these few rooms, it should be the central feature of a woman's building, the handsomest structure the University owns, where the young girls who come to the University may be brought in contact with it, and, therefore, in sympathy with its work, in spite of themselves and of their erroneous ideas of what this is all about, in spite of their earlier and wholly illogical prejudices against it.

THE DEPARTMENT OF HOUSEHOLD SCIENCE IN THE UNIVERSITY OF ILLINOIS.

Dr. Eugene Davenport, Dean of the Illinois Agricultural College, spoke at some length on the value of the work and its development in Illinois. Among other things, he said that:

The Department of Household Science was opened in the University of Illinois, due to a desire to give to the women of the university as fair a chance to be educated for life as was being given to the men.

The Department was organized in 1900. For a time it occupied rooms in the Agricultural building. Now it finds itself crowded for room in the large wing of the Woman's building, intc which it moved less than four years ago.

The State evidently appreciates the work it is doing, for the last legislature appropriated for its use, in addition to its regular annual income of $6,000, $10,000 more for each of the next two years.

THE INDUCTIVE OR SCIENTIFIC METHOD OF TEACHING COOKING.

(Miss Louise Stanley, Instructor in Home Economics, University of Missouri.)

The object of this discussion is to show what the inductive or scientific method of cooking is, and how it differs from other methods.

First, is there a science of cooking? The fund of human knowledge is divided into various sciences depending upon the point of view taken. All over-lap. The composition of a mineral is studied in both chemistry and mineralogy, the phenomena of osmosis in physics, chemistry, botany, physiology, and in cookery. Therefore, we can not draw a line and say on this side is one science and on that another. However, the chemist, with his point of view, draws from the mass of human knowledge those facts which explain chemical phenomena, and organizes this subject matter of chemistry into a logical whole, and this whole is the science of chemistry. In the same way, the facts that explain the phenomena involved in the preparation of food may be organized into a logical whole, the science of cooking. It draws largely from the other sciences to be sure, but does not the well-formed science of plant physiology do the same? When these scientific facts are arranged so as to explain the phenomena of cooking and nutritive value of foods, we have science of cooking; when arranged to explain life processes in the plant, we have plant physiology.

Our idea can, perhaps, best be brought out by comparison with the usual methods of teaching cooking. The most used is the recipe method. In this, the recipes are written upon the board, the student follows directions and prepares the dish. The work is merely hand training, purely imitative. Many schools, now to meet the plea that this is not educative, have brought in some science. Some give short science talks, while the girls are supposed to be interested in the preparation of their dishes, thereby diverting their minds from the work in hand, and the girls in their efforts to attend to two things at one time, lose most of the value of both. Others have many experiments to be performed; to what end? Simply that the student may or may not understand to better advantage the recipe that is still given her to follow.

The basis of organization of this work is varied. The usual "cooking-school" method is to have prepared during one lesson the various dishes which go to make a well-planned luncheon. Different girls are responsible for the various dishes, all observe each other and never fail to copy the recipes, for without them they are lost. At the end, the luncheon is served and eaten. Others base the organization upon the operations, baking one lesson, broiling the next, frying the next, etc. This is not so bad, for the thinking members of the class will be able to draw from the types under the various heads some general principles, but the recipe is still with us, so that the pupil need not think, unless she wants to, and the variation in the effect of heat on the different food principles is not taken sufficiently into account. Another teacher may divide her dishes according to food principles, starting usually with the most complex, the proteid, still using the recipe, and not using the beautiful opportunity of reasoning from step to step, with the deduction of general principles to take the place of the individual recipe. Lastly, many of the schools which consider themselves most scientific have made the outside science which they have brought in, the basis of their classification, without much regard to the proper relation of the cooking subject-matter itself. We claim that this is unscientific cooking, in that it simply serves to demonstrate some principles of the other sciences in any order in which they may have been brought together and at the end the student has no connected idea of the principles involved in the cooking subject-matter. That work of this kind is of value, must be acknowledged, but it should be gotten through correlation with, or as examples in the other science classes, and not serve as basis of classification for the cooking work. In this way we can distinguish between the course when given for its own value, and when it is given simply to strengthen or apply the principles of another science. In the first case it is a science, in the second, an *applied* science.

In the scientific method we have the material organized upon the basis of food principles, commencing with the simplest—the carbohydrates. Through a study of the chemistry and plant physiology of these substances in their pure forms, the student is enabled after a few experiments to cook these in their simplest combinations, formulating their own rules and recipes. In the mastery of any subject general principles must be grasped, and unless the specific types taken are taught in such a way as to bring out the general principles underlying the subject is not worthy of being called a science, and unless the principles deduced belong to the cooking science, we are, in cooking, teaching an applied and not a true science.

The goal of instruction, according to Dr. Frank McMurray (in his Method of the Recitation), is the general notion. Individual notions are important, in that they form the foundation for the general notion, but if from the individual notions we do not generalize, a large part of the value is lost. Let us see the value of this generalization in our own work.

Some two dozen or more cream soups are possible. Shall we cook each by an individual rule or recipe and cling carefully to it as most young cooks do? How many have you heard say, "I have a good recipe for cream or corn soup, but none for cream of celery?"

Even though they have them all, what a bother it must be to remember or keep them classified so as to be able to get at them in a moment's notice. Is it not better to take three typical kinds and from these deduce the general principles? One tablespoon of flour to one cup of liquid gives the usual consistency for cream soups. If the flavoring material added is thick, or has thickening properties, the amount is reduced, but in every case some flour must be added to set the material, or keep it from settling out. Water, milk, stock, or the strained vegetables with the water in which it was cooked may be the liquid; use milk when the greatest amount of nutriment is desired. In case acid material, as tomato, is used, special precautions in combining must be used, otherwise all follow the same rule. In this way the student not only has a smaller amount of material to keep in mind, but she is obliged to do some thinking, in order to get at these generalizations, and apply them later in other soups. She is no longer doing purely memory or imitative work, but is reasoning and applying this reasoning in a practical way.

Let us now take up a longer series, so as to show something of the organization, and how the steps are worked out. The starch series is one of the simplest. First, a number of experiments are given, showing the insolubility in cold water, the solubility and gelatinization in hot water. Various methods of combining starch and liquid are used, varied proportions are cooked, different starches and flour used in same proportions. All of these are moulded. Then corn starch pudding is to be cooked. The class know from experience the constituents. From the above experiments they can get at the proportion of starch to liquid, and also the method of combining. Sugar and flavoring are added to taste. At the end, the student has a recipe, but it is her own work, and she could cook the dish again without it. It simply serves to formulate her thoughts, and gives application of the general principles learned. She also knows that if wheat starch were to be substituted for the corn, the mould would be less firm; that should she substitute flour, twice as much would have to be used. She knows that starch can not be added directly to boiling water, for it will lump. Water, fat, or sugar may be used to separate the starch grains, and prevent the lumping when the hot water is added. Is not this better than having to cook a pudding with iron-bound proportions and method of combination? Not only have the students done some thinking, but they have a firm basis for future work. They can go on and with a little discussion formulate the recipes for cream sauce, cream soups, and from a study of the composition of cereals determine the amount of water to be added and length of time for cooking. Being thoroughly grounded in the same way in the study of all the elemental principles, the rest becomes easy, and they finally have a grasp of the subject which often experienced housewives never get. Many women cook well under certain conditions, but let these conditions change, and they are lost. They can not vary their rules to suit conditions; but even admitting they can, is not our way a short cut to what they have taken years to learn?

Summing up, the advantages of the method from the standpoint of the educative value of the subject seem to be:

(1) The advantage of the subject-matter proceeding from the simple to the complex, though this is sometimes used by the recipe teachers also.

(2) General principles to keep in mind, rather than an indefinite number of small rules.

(3) The cultivation of habits of thinking which is sadly needed to correct the memory habit of so many girls.

(4) Not only are they taught to think, but their thinking seems to be of peculiar value in that it functions in action.

Let us now look, for a moment, at the arguments against the method. They are: (1) cooking is not a science, but an applied science; (2) the method takes too long; the students can not get practice in cooking so many dishes as by other methods; (3) we should have exact recipes, and keep close to them.

We are perfectly willing to acknowledge that cooking may be and usually is taught as an applied science, but when we take the point of view of nutritive value and preparation of foods as the basis for the organization of our principles, we have, according to the very meaning of the word *science,* a science of cooking.

Does it take too long? Any one who is acquainted with the advantages of the inductive method in teaching the various subjects can not doubt its efficiency in this case. Is not spelling hard for us, simply because we can not use this method, but must use the recipe method? How much easier it would be if in that case, too, we could organize the whole subject under a relatively few guiding principles? Who would then care to go back to the older method, and how much faster we would learn to spell. The same is true in case of cooking. In a given time as many individual recipes may not be cooked, but a much better and more flexible grasp of the whole field is obtained. Instead of being able to prepare only those dishes taken in class, the student is able to prepare all those belonging to the groups of which these are types.

Lastly, are standard recipes desirable? People's standards and ideals vary, and so must the recipe. We can not say this is better than that, for personal whims play too large a part. But even granting that they are, we can not approach to them now on account of our lack of control of the exact composition of our food materials and of our operations. It seems better, then, to have a definite idea of the changes which varying proportions will bring about, than to be perfected in just one of these.

In closing, let us look for a moment at the change this will make in the preparation of our teachers. It means, we must have scientifically trained women, not women trained in one science, but somewhat in all the sciences. As physics depends on mathematics, chemistry on physics, and biology on both physics and chemistry, so the science of cooking depends on physics, chemistry, and the various biological sciences. Hence, the teacher of cooking needs a broader scientific training than the physicist, chemist, or even the biologist, for in addition to the knowledge of all these sciences she must be thoroughly grounded in the principles and processes involved in cookery; she should have the power of reasoning and of organization, so as to bring together the principles of cookery with the science material in their proper relations, so as to make the points most clear; and she must be versed in the laws of psychology and pedagogy, in order that she may be able to present the material in such a way that it will be best grasped by the students.

It seems much to require of one person, so much that a national committee for the purpose of drawing up a high school course in Home Economics seems to be willing to put in our subject as applied science, and, chiefly because there are not now prepared enough women to carry on the work in the other way. Here, in Missouri, as in some of the other schools in our country, we believe it can be done; that adequate preparation can be gotten in the four years, usually required for high school work, provided that work is wisely chosen.

The greatest bar to our progress at present is the fact that many of the schoolmen throughout the country realize only the practical value of the subject. Some are not willing to put it in at all on this basis, and others, seeing only this side, are putting in women who are not properly prepared—women who have only one or two years' training, or even less. It necessarily lowers the tone of the work, and makes it harder for us to insist upon a four years' course, when women from other schools get positions with less training. If the schoolmen will co-operate with those of us who demand the four years' of training, and raise the standards demanded of their teachers, the other schools will have to follow suit, and we will have better prepared teachers as a whole, instead of having to lower the type of work given.

HOME ECONOMICS, WHY IT SHOULD BE TAUGHT IN THE SCHOOLS, AND WHAT IT INCLUDES IN THE UNIVERSITY OF MISSOURI.

(Dr. Edna D. Day, in charge of the Department of Home Economics at the University of Missouri.)

In the olden days all girls were trained at home in household pursuits. This practice is no longer as common as it was, nor is it, under present-day conditions, as efficient a means of training for home-making as it was in the past. The old training was given not so much for the sake of the training, but because the daughters' help was needed by the mother in her work. Now, that the factory has taken from the home many of its former industries, it is no longer necessary that the girls, as well as the mother, should give their time to the housework. As a consequence, many other interests have developed that claim the time and energy of the growing daughters, and although some mothers still, by effort, arrange to give their girls household training, it is not so easily done as formerly.

However, although the necessary housework is less, the knowledge needed in the proper management of the home has increased.

Formerly almost everything needed in the home was produced in the home, or on the estate. This meant on the part of the homemakers, skill in doing many things; still, the whole process went on under their eyes and the eyes of their growing children, and the process and product were known. The food served on the table was grown in the garden and prepared in the kitchen and it didn't take long to learn the methods of preparation and the general digestive qualities of the few foods available. Now the world is our garden, and it is necessary to know the nature and value and methods of preparation of many more foods. They may be bought fresh or dried, salted or pickled, preserved in formaldehyde or boracic acid.

They are sold raw and half cooked, and ready to be eaten. They come in baskets, in boxes, in cans, in bottles. Our wisest grandmother would stand dismayed at the possibilities of choice and the need of knowledge of operations performed at a distance.

Then the wool from the sheep, the linen from the flax, and the cotton from the field were spun into thread, woven into cloth, and the cloth made into clothes at home. Now clothes-making has largely left the home; but clothes-buying is still a home problem, and no small amount of knowledge is needed to buy wisely.

The wells of our parents may have been polluted with leachings from their own privies, but at least the trouble was under their own control. Now water is often piped from a distance, and no amount of measuring the distance in the houses between the water and waste pipes will tell anything of the purity of the water supply.

Household wastes, while then by no means always ideally removed, at least less often had opportunity to become a source of nuisance and danger to neighbors at a distance. Today, in cities, the garbage from the best residence districts is sometimes dumped to fester near the homes of the poorest people, while the dirt and disease of these people is sometimes carried by food or garments prepared by them for sale, into the homes of the rich.

Observation of home industries will no longer give all the knowledge needed to economically and safely care for the household.

Moreover, mental and social contacts have broadened as fast as the physical. Servants are more restless. And, if parents are to retain the confidence and respect of their children, to say nothing of helping to prepare them for this broadening life, they must know the history of past culture and current events, including the latest triumphs of science and art, as well as psychology, pedagogy, and sociology.

Thus, today, there is more to learn that concerns the home, and less time in which to learn it. Some short-cut process must be used. Not only is it less easy for a mother to arrange to train her daughter at home, but the changed conditions make the precepts handed down from grandmother and the experiences gained by the mother herself insufficient to meet the still rapidly changing conditions. A study of underlying principles does much to shorten the time needed to learn details. Moreover, only an understanding of underlying principles makes adaptations to new conditions easily possible. Few home-makers know enough of these principles to competently teach their daughters. Moreover, it is easier for the school to do this teaching as it has long taught language, mathematics, and science.

Admitted that Home Economics should be taught in school, the question at once arises, in what schools?

Skill in manipulation is most easily acquired at the age when children are in the grades; therefore, the doing side of the work is best taught at this time. Moreover, it gives the teacher an opportunity to direct into useful channels the restless activity of the children, and to use it as a means of teaching the formal, in themselves, uninteresting reading, writing, and number work.

In the high school more of the reasons and general principles underlying the work can be developed, especially in correlation with the other science and art work. Here, too, its peculiar interest makes it of especial educative value. If properly taught, it can do more than other science work to develop the scientific spirit in girls. The other sciences have been organized by men and the illustrations all taken from a man's world are often more confusing than illuminating to a girl. Domestic science gives illustrations from her own world, and so makes this other science work more interesting and comprehensible to these girls. Since comparatively few students go beyond the high school it is very important from the home side that the work should be given here. It is also very important from both the home and school side that it should be well taught by properly prepared teachers.

While much can be done in the high school, until a student has had college or university work in physical, biological, and social sciences, and has reached the greater maturity of college years, many of the underlying principles cannot be fully grasped. In college, as well as in the lower schools, the work has especial educative value, because of its own inherent interest. Moreover, by its aid, all the work of a general college course planned originally for men can be made more interesting and valuable to women students.

Admitted that Home Economics should be taught in universities, as well as in the grades and high school what should it include?

Home Economics or Domestic Science, to most persons, means sewing and cooking. This is so, because sewing and cooking are the two operations of the home that can be most easily moved from the home to the school, and there studied concretely. An apron or a loaf of bread can, with the proper equipment, be as easily made at school as at home, and few schools attempt to make Domestic

Science more than sewing and cooking—and use the recipe method at that.

But Home Economics stands for much more, as perhaps the scope of this conference has indicated. The food problem itself is broader than mere cooking, even scientifically taught. It includes also a study of the nutritive and economic values of foods, and for its proper understanding, knowledge of the sciences of physics, chemistry, botany and physiology are necessary; also some knowledge of food production and pure food laws.

Even more fundamental to the home than food is the house, its material expression. Our students study houses, their plans, furnishings and care from the standpoint of health, convenience, cost and beauty.

As has been said, much of the family sewing has left the home; but the problem of a wise choice of dress goods is an ever increasing problem. It is said that more money is spent every year on dress than on any other attempt at art expression, yet how few women have been taught to apply principles of art and design to dress! Many women succeed, because they are born artists, but all might succeed with much less effort, if they were taught aright. In our course on textiles and dress we aim to teach the characteristics of different fibers and fabrics, their adaptation to different uses, the principles of dying and cleaning by laundry, and other methods, the relation of the consumer to the textile industry, and the application of the principles of design to dress. Technical courses in hand and machine sewing and dress-making may be taken along with this general course.

More important to the home than food or shelter or clothes are the children. Until recently it has been assumed that a mother knew by instinct how to bring up her children. But the fact that such a large proportion of the babies born into the world die before they are five years old, and the fact that we meet so many cross, irritable, sullen, or impudent children, suggest the conclusion that even mothers need to be taught the care of children. The university teaches its students how to raise corn and cattle, and pigs; how to care for sick babies, how to teach them in school from the elementary grades up but nowhere does it give training on the home care of normal children. The University of Missouri is not alone in this. At no place in the country is a proper training given. Dr. Elmer E. Brown, U. S. Commissioner of Education, is urging the need of this work (Independent, April 18, 1907, p. 905), and we want to do it. It is one of our own pet plans for the department.

We want some babies from an orphan home, and a woman who has had the training of a trained nurse, and a trained kindergartener to have charge of the work, and we want properly equipped rooms in which to do it. We await the public opinion that shall send us the money needed.

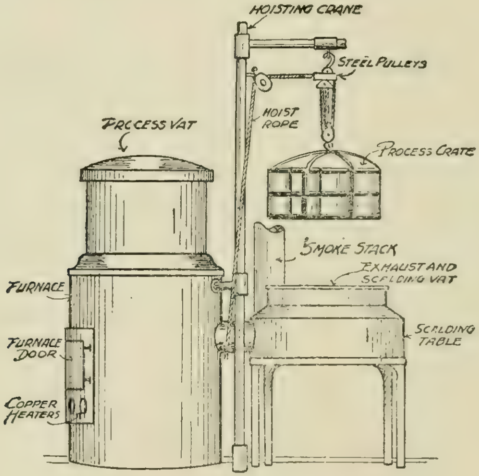
Even for the Home Economics' work on food, house and clothes that we are already giving, we are very much crowded for room. The work is popular with the girls, and the classes are growing rapidly. We much need a building of our own. The farmers of the State have seen to it that the University has a beautiful, large dairy building. Are not the interests of the home as important as the interests of the dairy? I am sure that you agree that they are greater, and that you will give your earnest, hearty support when we ask the legislature at its next meeting to grant money for a Home Economics building in which University of Missouri young women will be trained to make happy homes for the State.

MISCELLANEOUS.

THE FARM CANNING FACTORY.

(Miss Annie Hoffarth, Bendavis, Mo.)

The canning machine has made it possible for the farmer to supply his table with vegetables in winter as well as summer. More than that, it has made it possible for him to save and market the surplus vegetables and fruit at a profit.


HOISTING CRANE
STEEL PULLEYS
HOIST ROPE
PROCESS VAT
PROCESS CRATE
SMOKE STACK
EXHAUST AND SCALDING VAT
FURNACE
SCALDING TABLE
FURNACE DOOR
COPPER HEATERS

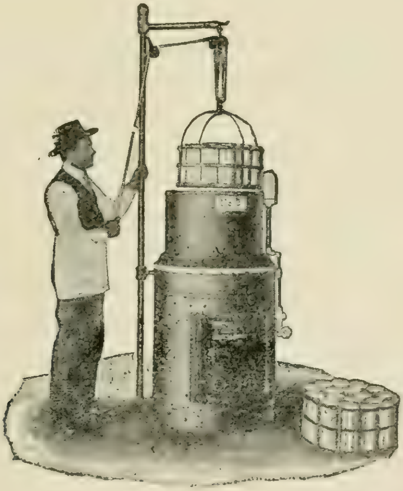
The process of canning is simple and readily learned by any person of average intelligence, and the machinery is neither complicated nor expensive. I purchased my first canning machine in 1903. It was the first one I ever saw, and I knew nothing about the process of canning by this method. By studying and following the plain, simple instructions that accompanied the canning machine, I soon had string beans, corn and tomatoes canned.

Six months elapsed before any of this canned goods was opened, and it was found to have kept perfectly. Those who ate my canned goods pronounced them far superior to any canning factory products. The reason of this superior quality was due to the fact that all my canned goods were gathered, packed and cooked before they were allowed to deteriorate.

Two and three pound tin cans are used the same as in a regular canning factory. The fruit and vegetables are packed in the cans raw, and the cans are soldered up and their contents cooked the required length of time. String beans and peas are first blanched before being packed in the cans. That is, they are boiled in clear water for ten minutes in order to wilt them so that more can be packed in a can.

All the preservatives used in canning, is a weak salt brine in canning corn, peas and string beans, and only enough salt is used to season to taste.

Strawberries, cherries, raspberries, pears and fancy peaches are packed in a syrup made by dissolving granulated sugar in water. Some have packed apples in syrup and report a greater demand for them, than for their peaches. Since but a small quantity of sugar is required for making the syrup, this will prove to be a more profitable way of utilizing the surplus apples, than to evaporate them.



The length of time required to properly cook the canned goods, varies from six minutes for strawberries to five hours for corn. Corn is cooked by compressed steam in the canning factories, because this method raises the temperature to 240 degrees, and only a short length of time for cooking is required to destroy the fermenting germs and insure its keeping qualities. This same end may be accomplished, however, by cooking at 212 degrees, or the boiling point for the full five hours.

Some have tried a new method that shortens the time of cooking more than one-half in canning corn with the canning machine. One pound of chloride of calcium, costing three cents per pound, is dissolved in each gallon of water used in the boiler. This raises the boiling point from 212 to 240 degrees and greatly expedites the work of canning corn. The water is drawn off at night to prevent the boiler from rusting, but can be used again and again until the corn is all canned.

Figs, pineapples, nectarines and all the fruits and berries common to our latitude are canned with the farm canning factory. Among the list of vegetables may be found tomatoes, peas, string beans, pumpkins, okra, sweet potatoes, corn and kraut; in fact, anything that is canned by the large canning factories.

Beef and chicken are cooked as for table use, packed in cans and canned with the canning machine also, and when once placed on the market will supersede much of the canned goods now used by the public.

The fact that the home-canned goods will meet the most rigid requirements of the pure food law, is sufficient indorsement of their quality.

Mr. R. Byrd Leeper of Unionville, Ill., a farmer and farmers' institute lecturer, and owner of a large orchard, purchased a canning machine in 1907 to can his fruit and tomato crop for the market. He put up some 15,000 or more cans, which included, besides peaches, tomatoes and string beans, some corn, sweet potatoes, pumpkins and pie-plant. Dr. Don Gilberto, the specialist of Paducah, Ky., who always ordered all his canned goods and even his Irish potatoes from Germany, heard of Mr. Leeper's canned goods. Dr. Gilberto ordered a sample of them, but without stating his purpose, and proceeded to subject them to the most crucial tests to discover, if possible, any acids or coloring matter. The result was so satisfactory that he ordered a supply for his own table use, showing that even an epicure finds the products of the farm canning factory equal to any other canned goods.

Tomatoes and peaches are considered the most profitable crops to can for market, the amount of profit realized, depending largely on the business ability of the individual, just as in all other callings.

The following estimate of expense and profit has been kindly furnished by a gentleman who has had years of experience in canning goods for the market:

Average yield of tomatoes per acre = 300 bu. = 10 tons = 5,400 No. 3 or 3-lb. cans.

Average cost of peeling tomatoes	$11 25
Average cost of packing tomatoes	8 00
Average cost of processing tomatoes	3 00
Average cost of capping and tipping	3 00
Cost of fuel	1 00

Highest known crop of tomatoes produced on one acre—20 tons = 10,800 3-lb. cans.

Very low crop to acre—3 tons = 1,800 3-lb. cans.

Tomatoes are peeled in fibre buckets holding fourteen quarts, and peelers are paid at the rate of three cents per bucket. Rapid girls will peel as high as 50 buckets of tomatoes in ten hours.

Packers are paid from 50 cents to $1.00 per day. Processers from $2.50 to $4.00 per day. Cappers and Tippers from $1.00 to $2.00 per day, and a fireman $1.00 to $1.50 per day.

Much depends upon the help, and the employer must be the judge in regard to the amount of work each one can turn off and the wages they earn. Except for the work of processing and that of the fireman, most of the work is done by women and children, and where there are several in family, no hired help is needed.

This reduces the expense to the cost of cans only, which is estimated at about 2 to 2¼ cents each for three pound and 1½ to 1¾ cents each for two-pound cans, when purchased in small lots. Solder-hemmed caps cost about $1.50 per thousand and are by far the best and easiest to use.

Prices received for the canned goods vary according to the market sought, just like all other farm produce, but the demand always exceeds the supply.

CHARLES READE, 2:24¼.

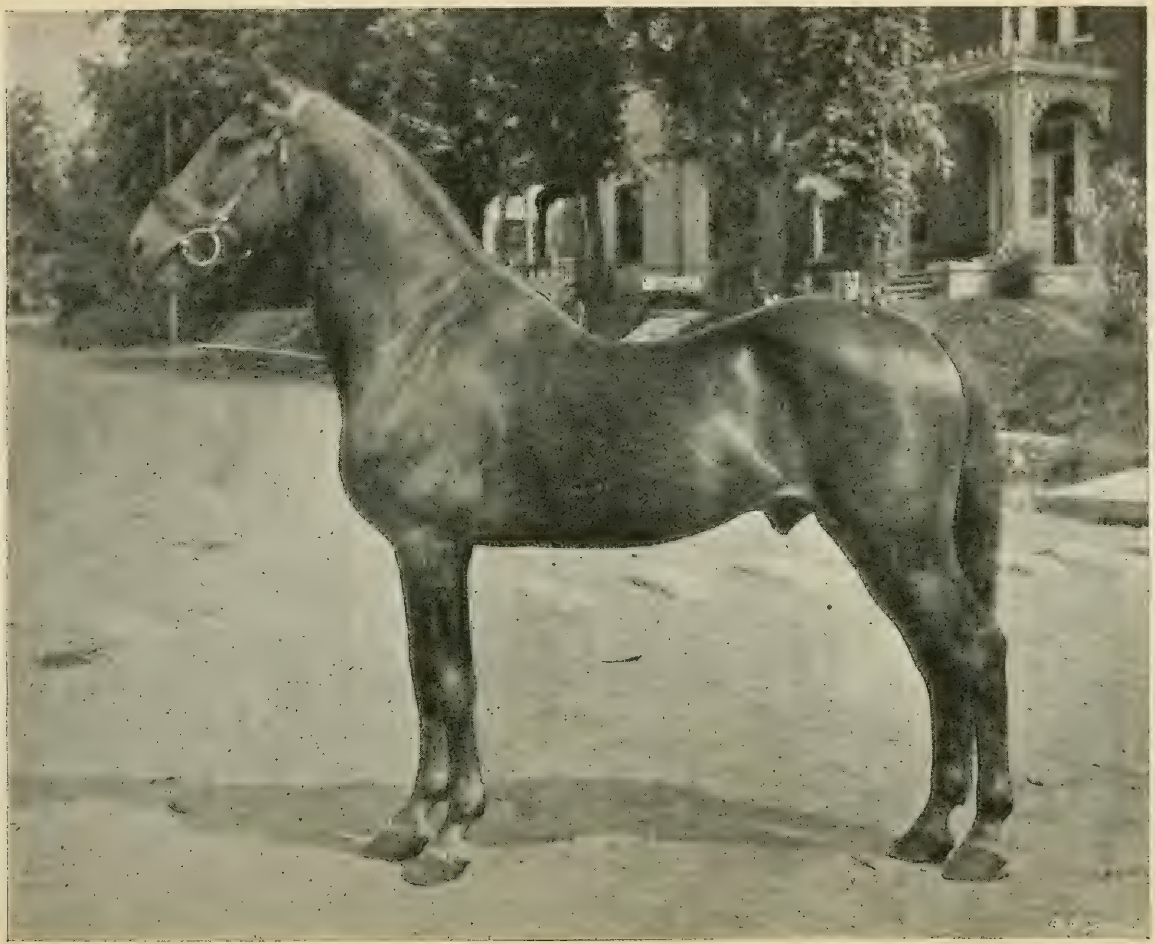
(The following story of the breeding of one of the most noted Missouri-bred horses of any breed is given not alone for its historic value, but for its value in the study of close breeding, which is found in the pedigree.)

8246 American Trotting Register.
3953 American Morgan Register.

<table>
<tr><td rowspan="4">CHARLES READE.</td><td rowspan="2">ETHAN ALLEN, Jr., 473.
Sire of Tana.......2:12¼
" Archbishop ...2:19½
" Shepherd Boy..2:23½
" Charles Reade. 2:24¼
" Aurinda 2:25
" Ecxford 2:25¼
" Allen 2:28¼
" Charles C.....2:28½
" Dexter 2:29
" Falka 2:29½
" 4 sires of 13 performers.
" 6 dams of 6 performers.</td><td>ETHAN ALLEN 43
Grandsire of 125 standard performers.</td><td>BY BLACK HAWK 5
Sire of 4 performers.
" 14 sires of 23
" 2 dams of 2.</td></tr>
<tr><td>FANNY COOK
Dam of Daniel Lambert 102, grand dam of 46 standard performers.</td><td>BY ABDALLAH 1.
Sire of 4 performers.
" Hambletonian 10 dams of Goldsmith
" Maid, 2:14, and 6 others.</td></tr>
<tr><td rowspan="2">PRINCESS DAGM'R
Dam of Wisteria, trial (4 years)........2:25</td><td>DANIEL LAMBERT 102
Sire of 38 standard performers.
" 25 great brood mares.
Grandsire 246, among which are
Baronet, 4 years...2:11½
Pamlico..........2:10
Dandy Jim........2:19¼
PRIMA DONNA.....2:09½</td><td>BY ETHAN ALLEN 43.
Sire of 6 performers.
" 22 sires of 106;
" 14 dams of 19.</td></tr>
<tr><td>DAUGHTER OF</td><td>ETHAN ALLEN 43.
Sire of 6 performers.
" 22 sires of 106.
" 14 dams of 19.</td></tr>
</table>

The history of Charles Reade starts with a theory. The theory had its inception in the brain of Thomas Lafon; a dreamer and student as well as horseman. He tells us all about this in an article that appeared in "Bit and Spur," October 15th, 1907, entitled "How Charles Reade Happened." The significant fact that we wish to emphasize at the outset is that *Charles Reade is not an accident;* but rather the logical product of a carefully figured out theory in scientific horse breeding.

It seems that it was a study of the pedigree of Maude S. that gave Mr. Lafon his clue, she being by Harold who was inbred to Abdellah 1, his parents being by that horse; but further *their dams* were half-sisters, being by imported Bellfounder, which, as Lafon figures, makes the immediate progenitors of Harold five-eights brother and sister. Now if such cumulative inbreeding could produce a sire as prepotent as Harold proved himself to be when



coupled with mares adapted to him, and when his union to a three-quarter thoroughbred produced a Maude S., then it would seem to follow logically: first, that thoroughbred blood in a trotting pedigree, when properly controlled, is a valuable factor; and, second, that inbreeding would seem to intensify a trotting sire's power of controlling speed and action. Now, there was a family of horses purer and better gaited than that from which Harold sprung, and if the same system of inbreeding should be followed in that family, a sire might result that would have greater controlling power over his progeny. The family referred to was that of Ethan Allen, than whom a better gaited trotter has never been known. But Ethan Allen was more than a trotter, he was a great roadster, extremely handsome, and of a disposition and intelligence never excelled. The conclusion of the whole matter was that Mr. Lafon decided to procure a horse as closely inbred to Ethan Allen as safety would permit, but I will give the rest of his story in his own words.

"During the years 1882-3-4 I was in Mexico and Central America building railroads.

It must have been some time during the spring or early summer of 1883 that I saw an announcement, probably in the "Breeder and Sportsman," a San Francisco publication that had shortly before been launched by that prince of horsemen, Joseph Cairn Simpson, to the effect that General William T. Withers had purchased Woodward's Ethan Allen, Jr., for use as a private stallion at his famous Fairlawn Farm. Here was a possible chance to get what I wanted. I had long known Gen. Withers by reputation, and the character generally accorded him for integrity and fair dealing was of the highest order. The horse was in "the sere and yellow leaf," but I cared little for that, for I much preferred a sire of extreme age to one of extreme youth. The writings of the Rev. W. H. Murray, sometimes called Adirondack Murray, had put me on to that.

I wrote Gen. Withers, telling him what I wanted, saying that Woodward's Ethan Allen, Jr., would suit for the sire, asking if he had an Ethan Allen mare that was well bred on her dam's side, and if he had not would he get one, and for terms. In due time, six weeks or two months later, the reply came. It lies before me now. It is addressed to Champurvis, Central America, and dated Lexington, Ky., August 13, 1883. He had no Ethan Allen mare and could not get a good one that he had any degree of confidence in being so bred, but he had three mares that carried more or less

Ethan Allen blood. The first was by Dan Lambert, the full brother to his horse, and the best son of Ethan Allen by the records. Her dam was Cigarette by Hambletonian 10, 2nd dam Imported Crinoline by Kremlin.

The second was also by Dan Lambert and her dam was by Ethan Allen 43.

The third was by C. M. Clay, Jr., 22, dam by Almont 33; 2d dam Kate O'Brien by Ethan Allen 43.

The first and third I promptly turned down and reserved the second for further consideration. As her sire and dam were both by Ethan Allen, she had as much of his blood as if she was his immediate daughter. There was nothing said about her second dam, but the fact that Ben. E. Bates had used her dam as a brood mare at his well known place in Watertown, Mass., where she was foaled, was a sufficient guarantee of her (the dam's) quality. She was called Princess Dagmar, and I decided to accept her as the dam of my future sire. After two or three more letters, arranging details, had been exchanged, I sent Gen. Withers $250 and he agreed that the nuptials of Ethan Allen, Jr., and Princes Dagmar should take place in the spring of 1884. Princes Dagmar had been bred to Happy Medium in 1883 and was believed to be with foal.

In the summer of 1884 I returned to the states and visited Fairlawn in the fall. I had a pretty good idea of what to expect of Ethan Allen, Jr., and found him just about what I had anticipated.

Princes Dagmar had just weaned her first foal, a filley by Happy Medium, and was somewhat thin, but she showed all the quality and style of the Lamberts, was well muscled, had speedy lines, and I was pleased with her. I did not see her in harness because she never had a harness on. Gen. Withers had his brood mares broken only to make them gentle and easy to handle, and as Princes Dagmar was already that they never broke her. Her filley by Happy Medium, called Wistaria, was a shapely little thing, and R. S. Withers, the General's son and manager, told me that she was the fastest weanling on the place. I think they had 22 in the bunch that she was in.

Princes Dagmar was barren in 1885 and the colt subsequently named Charles Reade, was foaled on June 1, 1886."

Charles Reade was brought by Lafon to Columbia when a colt, and has remained here ever since. He is a beautiful chestnut, fifteen and a half hands high, of pronounced Morgan type and character. His most striking feature is his eyes, large, luminous and intelligent, with a sparkle that age can not dim, giving to his countenance an expression that is human in its intensity. No horse that ever lived possesses a more imposing front, a neck better set or a head more proudly carried. In action and courage he is the equal of his great progenitor, Ethan Allen, and no more could be said. The cut accompanying this article was made from a photograph taken after the horse had passed his twentieth year. It shows him a little drawn at the girths and with back swayed, structural faults that were not apparent when in his prime and that have never re-appeared in any of his get; but age has not impaired his action, speed or prepotency. In fact, as an individual he is in every respect Lafon's dream come true.

A more important question remains: Has his get established the theory of the value of an infusion of thoroughbred blood and the ability of an inbred trotting sire to control character and action? Unfortunately, in the community where this horse is located, there were and are few mares of the breeding necessary to give this theory a fair test; but in instances where Reade went to mares of proper blood lines results were all that could be desired. Take the case of Mrs. Cleveland, owned by the McAlesters of Columbia. She was by Riggs Abdellah, by Kimbros Abdellah, by Abdellah 1, out of Fannie Bowling, a thoroughbred, by Imported Glendower. This mare produced Ruth, a sensational actor of speed and beauty that sold for $3,700; Starlight, a heavy harness horse of the best type that W. H. Leonard, a dealer, paid $1,000 for when hardly broke; Dr. Mack, one of the greatest light harness geldings ever in Missouri; Cleveland Reade, for which his owner has refused four figures; and a yearling that sold for $500. In fact, this mare has never produced anything that was not first class, all her colts possessing speed, action and beauty and of a type demanded by the fancy trade. A significant fact in this mare's pedigree is that she traces back in the third generation to Abdellah 1 as does Charles Reade. In this mare's get we have a strong infusion of thoroughbred blood controlled and made perfect in action and character by an inbred trotting sire. Again, take the mare Alice S, dam of Sometimes and Always, champion harness pair at the World's Fair. Also the dam of Highball and a promising filley, a winner as a two-year old, and yet to be heard from. Highball was a most sensational high acting gelding. He won many premiums at the World's Fair, and was never defeated in local shows in the harness class until the judges put him second to another Reade. A glance at the pedigree of Alice S is instructive. She was standard and registered. On her sire's side containing the blood of Hamiltonian 10 and Abdellah 15. On her dam Blackhawk by Sherman Morgan. Here we have a strong mingling of Ethan Allen and Blackhawk blood—inbred Morgan upon Morgan—giving results that leave nothing to be desired. The same is true in the case of the mother of Columbia Girl, the greatest harness mare ever shown in Missouri, where the blood of Rattler Morgan was mingled with that of Ethan Allen through Reade.

We need not multiply examples to prove our theory. The fact is where Reade has been bred to mares with an infusion of thoroughbred blood—not too close up—or to mares of Morgan ancestry, there has uniformly resulted a harness horse of good size, magnificent presence, high action and speed. They have been of the heavy harness type demanded by the best trade and have won honors in the shows all over the United States.

So strong is the power of Charles Reade to impress his individuality upon his get that they constitute a distinct family recognizable wherever seen.

They are a Missouri family of horses of which the State should be proud, and while Reade is no longer young, he possesses the vitality of his youth and gives promise of many years of usefulness in the stud. With better mares he will get better colts, and the "Reades" of Missouri may yet make Kentucky look to her laurels as a horse breeding center.

STUDENTS JUDGING SWINE.

MISSOURI CROP REVIEW FOR 1907.

Taken as a whole, the year 1907 was a favorable one for the farmers of Missouri. Although the season was delayed by cold, wet weather during April and May, the acreage of the principal crops was equal to or greater than for the previous year. The yields, taken as a whole, were fairly satisfactory, and, up to the time of the money stringency, in October, the average farm price of all crops was better than for many years.

Corn.—Cold, wet weather during April and May caused much replanting, and a great deal of late planting. The acreage, however, for 1907, was 7,086,000, which is one per cent. more than for the previous year. Throughout most of the southwest quarter of the State a severe drought prevailed through the cultivating season, and materially reduced the yield. The southwest section, composed of 23 counties, shows the greatest loss. The average yield in that section is only 23.8 bushels, compared with a yield in 1906 of 32.2 bushels—a loss of about ten bushels per acre. The southeast section yielded 26.3, compared with 33 bushels in 1906. A number of counties, however, in the southern part of the State, made a yield equal to the crop of the previous year. The northwest section of the State shows the greatest increase over last year. During 1906 a severe drought prevailed in that section; but in 1907 the weather was very favorable, and the yield in that section for 1907 is 39.5 bushels per acre, or nearly 5 bushels more than for the previous year. Many counties in this section made an average yield of 40 to 44 bushels per acre. The northeast section made an average yield of 36.6 bushels, just five bushels more than for the previous year. By comparison with the government report for the United States it will be seen that the northern part of the State produced a greater average yield than any state in the Union. The total product for the State in 1907 is 232,541,324 bushels—an average yield for the entire State of 32.7 bushels, which is .7 of a bushel below that of 1906, or a total product of about 600,000 bushels less than for the previous year.

The average farm price of corn this year, on December first, was ten cents more than the price one year previous. If the corn could all have been sold at that price, it would have yielded the farmers $23,000,000 more money than the crop of the previous year; however, this crop will perhaps bring the farmers less money than the previous crop. A very large percentage of the corn crop of this State is fed to live stock, and most of that fed to hogs this year will be fed at a loss, because 4-cent hogs will not yield a profit on 50-cent corn.

Wheat.—The wheat crop of the State for 1907 was a full average, though not up to the crop for the previous year. The plant lice, or "green bugs," which caused so much loss in the southwest, did only a small amount of damage in this State. A few counties in the southwestern part of the State were damaged some on this account. The quality of the grain at the time of harvest was usually good, but excessive rains after harvest, and before the crop could be threshed, caused considerable damage.

The acreage sown in the fall of 1907 for the crop of 1908 is estimated at 8 per cent. below the crop of 1906, making the present cultivated acreage 2,110,669. The greatest decrease in acreage is in the northeast section, where there is a loss of 13 per cent. The largest acreage, compared with the previous year, is in the central section, where it is 96 per cent. The decreased acreage is due largely to droughty conditions during the season of planting, making it difficult to prepare the land for seeding.

WHEAT HARVEST CALENDAR OF THE WORLD.

The following shows the months of the wheat harvest in the different wheat-growing sections of the world:

January—Australia, New Zealand, Chili, and Argentine Republic.

February and March—East India, and Upper Egypt.

April—Lower Egypt, Syria, Cyprus, Persia, Asia Minor, India, Mexico, and Cuba.

May—Algeria, Central Asia, China, Japan, Morocco, Texas, and Florida.

June—Turkey, Greece, Italy, Spain, Portugal, South of France, California, Oregon, Louisiana, Mississippi, Alabama, Georgia, Carolina, Tennessee, Virginia, Kentucky, Kansas, Arkansas, Utah, Colorado, and Missouri.

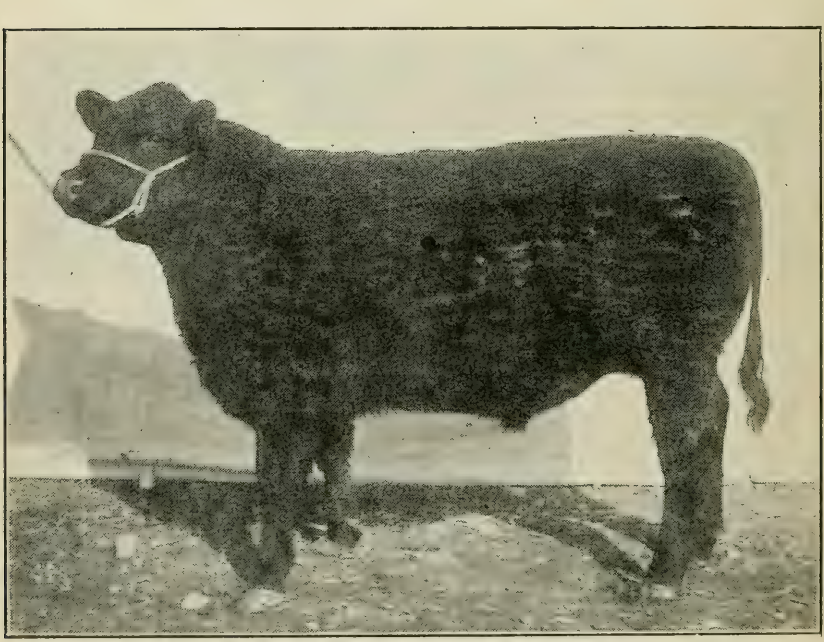
July—Roumania, Bulgaria, Austro-Hungary, South of Russia, Germany, Switzerland, France, South of England, Nebraska, Minnesota, Wisconsin, Iowa, Illinois, Indiana, Michigan, Pennsylvania, Ohio, New York, New England, and Upper Canada.

August—Belgium, Holland, Great Britain, Denmark, Poland, Lower Canada, Columbia, Manitoba, and Dakota.

September and October—Scotland, Sweden, Norway, and North of Russia.

November—Peru, and South Africa.

December—Burmah.



ROYAL LAD OF OAKLAND.
Shown as a calf.

Grand Champion Angus Steer, owned and exhibited by the University of Missouri at the State Fair, 1907.

WHEAT AND OATS.

Table giving acreage, average yield per acre, and total product of wheat and oats, by counties for the year 1907:

	Wheat.			Oats.		
	Acreage......	Average yield per acre, bu..	Total yield per county, bu..	Acreage......	Average yield per acre, bu..	Total yield per county, bu..
State..........................	2,224,078	15.6	28,830,014	720,412	21.7	15,164,714
County						
Adair..........................	2,076	15	31,140	3,467	20	69,340
Audrain..........................	1,185	15	17,775	22,911	29	664,419
Andrew..........................	5,165	18	92,970	5,793	25	144,825
Atchison..........................	5,967	16.5	98,455	24,145	20	482,900
Barry..........................	35,636	7	249,452	5,363	20	107,260
Barton..........................	14,612	8	116,896	9,760	13	126,880
Bates..........................	19,237	12	230,844	14,815	15	222,225
Benton..........................	11,330	13.5	152,955	8,292	14	116,088
Bollinger..........................	22,944	9	206,496	4,711	20	94,220
Boone..........................	21,615	17	367,455	7,025	22	154,550
Buchanan..........................	35,248	18.5	652,088	3,993	27	107,811
Butler..........................	1,800	10	18,000	1,510	25	37,750
Caldwell..........................	2,499	19.5	48,730	2,423	28	67,844
Callaway..........................	29,243	17	497,131	10,911	20	218,220
Camden..........................	6,960	12	83,520	2,990	18	53,820
Cape Girardeau..........................	58,186	9	523,674	5,727	25	143,175
Carroll..........................	23,926	18	430,668	6,270	22	137,940
Carter..........................	1,440	9	12,960	540	20	10,800
Cass..........................	21,037	15	315,555	12,536	18	225,648
Cedar..........................	11,751	10	117,510	8,635	17	146,795
Chariton..........................	25,951	13	337,363	4,125	22	90,750
Christian..........................	31,202	10	312,020	5,134	18	92,412
Clark..........................	7,634	17	129,778	27,450	28	768,600
Clay..........................	8,232	18	148,176	2,038	28	57,064
Clinton..........................	3,190	20.5	65,395	4,654	30	139,620
Cole..........................	33,425	15	501,375	3,785	25	94,625
Cooper..........................	54,830	14	767,620	7,151	18	128,718
Crawford..........................	14,106	10	141,060	2,246	17	38,182
Dade..........................	26,884	10	268,840	9,984	18	179,712
Dallas..........................	8,262	8	66,096	5,991	16	95,856
Daviess..........................	5,852	20	117,040	2,990	31	92,690
DeKalb..........................	2,053	17.5	35,926	3,307	28	92,596
Dent..........................	13,965	11	153,615	2,060	18	37,080
Douglas..........................	17,045	6.5	110,792	2,988	20	59,760
Dunklin..........................	3,919	13	50,947	972	20	19,440
Franklin..........................	79,785	13	1,037,205	7,168	19	136,192
Gasconade..........................	36,441	13	473,733	4,346	20	86,920
Gentry..........................	1,633	21	34,293	6,049	28	169,372
Greene..........................	43,855	11	482,405	12,914	20	258,280
Grundy..........................	3,486	19	66,234	3,165	35	110,775

WHEAT AND OATS—Continued.

County.	Wheat.			Oats.		
	Acreage......	Average yield per acre, bu..	Total yield per county, bu..	Acreage......	Average yield per acre, bu..	Total yield per county, bu..
Harrison....................	2,576	21	54,096	8,762	30	262,860
Henry....................	28,584	12	343,008	13,997	14	195,958
Hickory....................	7,230	13	93,990	4,556	17	77,452
Holt....................	7,766	18.5	143,671	14,328	20	286,560
Howard....................	40,832	13.5	551,232	1,804	20	36,080
Howell....................	21,465	8	171,720	3,025	25	75,625
Iron....................	2,020	12	24,240	1,000	20	20,000
Jackson....................	21,415	15	321,225	5,701	24	136,824
Jasper....................	62,244	10.5	653,562	15,999	12	191,988
Jefferson....................	25,075	12	300,900	2,192	20	43,840
Johnson....................	57,012	15	855,180	8,896	22	195,712
Knox....................	1,836	15	27,540	45,747	20	914,940
Laclede....................	9,381	8	75,048	3,965	16	63,440
Lafayette....................	48,144	17.5	842,520	11,543	18	207,774
Lawrence....................	68,620	9.5	651,890	12,799	20	255,980
Lewis....................	5,870	17	99,790	6,523	20	130,460
Lincoln....................	44,922	18	808,596	12,571	22	276,562
Linn....................	4,462	17	75,854	3,637	25	90,925
Livingston....................	8,790	18	158,220	4,063	25	101,575
McDonald....................	15,630	10	156,300	2,091	15	31,365
Macon....................	6,516	16	104,256	3,064	30	91,920
Madison....................	8,445	10	84,450	1,022	20	20,440
Maries....................	13,876	9	124,884	2,454	25	61,350
Marion....................	17,345	17	294,865	2,929	25	73,225
Mercer....................	1,565	16	25,040	4,917	25	122,925
Miller....................	14,986	12	179,832	3,885	23	89,355
Mississippi....................	31,212	9	280,908	140	25	3,500
Moniteau....................	28,939	14	405,146	7,884	20	157,680
Monroe....................	9,480	16	151,680	9,076	23	208,748
Montgomery....................	19,120	16	305,920	14,666	18	263,988
Morgan....................	14,712	14	205,968	5,865	20	117,300
New Madrid....................	14,406	9	129,654	293	20	5,860
Newton....................	40,902	8	327,216	6,713	12	80,556
Nodaway....................	5,936	18	106,848	22,919	20	458,380
Oregon....................	13,277	9	119,493	2,250	25	56,250
Osage....................	38,525	15	577,875	2,378	25	59,450
Ozark....................	8,575	7	60,025	1,634	25	40,850
Pemiscot....................	5,063	12	60,756	68	20	1,360
Perry....................	53,582	12	642,984	4,698	20	93,960
Pettis....................	24,585	15	368,775	6,902	17	117,334
Phelps....................	10,728	10	107,280	3,710	17	63,070
Pike....................	47,566	16.5	784,839	12,719	25	317,975
Platte....................	41,005	18	738,090	2,631	32	84,192
Polk....................	20,493	10.5	215,208	10,996	15	164,940

WHEAT AND OATS—Continued.

County.	Wheat.			Oats.		
	Acreage......	Average yield per acre, bu..	Total yield per county, bu..	Acreage......	Average yield per acre, bu..	Total yield per county, bu..
Pulaski....................	7,234	9	65,106	2,066	20	41,320
Putnam....................	1,548	16	24,768	5,973	30	179,190
Ralls.......................	11,665	17	198,305	5,863	27	158,301
Randolph..................	3,377	18	60,786	2,636	25	65,900
Ray.........................	13,726	17	233,342	2,394	20	47,880
Reynolds..................	2,292	9	20,628	790	18	14,220
Ripley......................	5,102	12	61,224	3,619	25	90,475
St. Charles................	70,853	17	1,204,501	8,078	28	226,184
St. Clair....................	8,132	11	89,452	8,725	14	122,150
Ste. Genevieve.............	31,768	13	412,984	1,268	20	25,360
St. Francois................	15,024	13	195,312	1,528	20	30,560
St. Louis...................	49,706	12	596,472	2,478	20	49,560
Saline......................	54,153	16	866,448	6,823	18	122,814
Schuyler....................	3,096	18	55,728	5,488	24	131,712
Scotland....................	1,199	16	19,184	10,491	26	272,766
Scott........................	52,574	9	473,166	220	25	5,500
Shannon....................	3,060	7	21,420	823	18	14,814
Shelby......................	15,109	17.5	264,407	7,946	28	222,488
Stoddard....................	25,645	9	230,805	1,979	22	43,538
Stone........................	8,798	9	79,182	1,515	20	30,300
Sullivan.....................	835	16	13,360	3,055	28	85,540
Taney........................	6,788	7	47,516	1,646	22	36,212
Texas........................	20,828	8	166,624	3,382	18	60,876
Vernon......................	12,952	10	129,520	11,130	17	189,210
Warren......................	24,809	16	396,944	7,058	19	134,102
Washington.................	15,315	11	168,465	2,089	18	37,602
Wayne.......................	7,212	11	79,332	1,404	20	28,080
Webster.....................	19,115	8	152,920	6,058	18	109,044
Worth........................	1,188	22	26,136	3,549	30	106,470
Wright.......................	12,652	8	101,216	2,992	17	50,864

CORN, HAY AND FORAGE.

Table giving acreage, average yield per acre, and total product of corn and of hay and forage, by counties, for the year 1907:

	Corn.			Hay and forage.	
	Acres planted.	Average yield per acre, bu.	Total yield per county, bu.	Acres.	Total yield per county, tons.
State	7,086,059	32.7	232,541,324	3,288,111	4,200,027
County.					
Adair	67,762	39	2,642,718	66,645	79,974
Audrain	123,491	36	4,445,676	57,946	69,535
Andrew	92,049	37	3,405,813	30,470	39,611
Atchison	170,109	42	7,144,578	17,880	25,032
Barry	52,448	17	891,616	13,950	13,950
Barton	95,755	20	1,915,100	29,760	29,760
Bates	146,105	27	3,944,835	67,600	94,640
Benton	56,551	32	1,809,632	27,100	32,520
Bollinger	30,681	27	828,387	11,325	11,325
Boone	84,108	40	3,364,320	48,700	53,570
Buchanan	68,696	42	2,885,232	20,600	35,020
Butler	23,056	28	645,568	6,600	7,920
Caldwell	85,128	40	3,405,120	45,060	76,602
Callaway	81,749	37	3,024,713	51,440	56,584
Camden	30,164	26	784,264	11,400	11,400
Cape Girardeau	31,755	29	920,895	20,540	20,540
Carroll	145,466	40	5,818,640	49,080	68,712
Carter	10,217	18	183,906	2,320	2,320
Cass	107,209	35	3,752,315	61,150	85,610
Cedar	54,173	24	1,300,152	18,400	22,080
Chariton	73,953	40	2,958,120	55,600	77,840
Christian	43,430	22	955,460	13,780	16,536
Clark	90,718	36	3,265,848	47,880	71,820
Clay	70,191	36	2,526,876	20,465	32,744
Clinton	100,177	40	4,007,080	37,040	59,264
Cole	23,014	30	690,420	17,300	25,950
Cooper	75,847	35	2,654,645	24,620	32,006
Crawford	28,337	30	850,110	13,000	13,000
Dade	64,484	20	1,289,680	17,000	22,100
Dallas	45,742	20	914,840	19,200	23,040
Daviess	107,669	42	4,522,098	56,415	90,264
DeKalb	101,358	35	3,547,530	41,635	41,635
Dent	32,343	18	582,174	16,130	19,356
Douglas	38,704	20	774,080	13,250	13,250
Dunklin	43,947	29	1,274,463	5,000	7,500
Franklin	48,802	30	1,464,060	24,000	33,600

CORN, HAY AND FORAGE—Continued.

County.	Corn.			Hay and forage.	
	Acres planted.	Average yield per acre, bu.	Total yield per county, bu.	Acres.	Total yield per county, tons.
Gasconade	21,202	30	636,060	12,460	21,182
Gentry	91,512	41	3,751,992	52,495	52,495
Greene	77,836	23	1,790,228	26,400	31,680
Grundy	80,532	40	3,221,280	55,460	66,552
Harrison	127,324	40	5,092,960	80,255	120,382
Henry	108,001	27	2,916,027	45,430	54,516
Hickory	35,358	22	777,876	16,200	17,820
Holt	97,425	40	3,897,000	11,375	18,200
Howard	45,555	37	1,685,535	27,240	32,688
Howell	42,927	20	858,540	13,000	13,000
Iron	13,342	25	333,550	8,700	10,440
Jackson	102,492	40	4,099,680	42,175	63,262
Jasper	74,120	20	1,482,400	18,170	18,170
Jefferson	41,740	36	1,502,640	20,140	26,182
Johnson	105,789	35	3,702,615	54,970	76,958
Knox	62,476	37	2,311,612	58,460	64,306
Laclede	33,670	25	841,750	24,100	31,330
Lafayette	119,012	38	4,522,456	35,070	49,098
Lawrence	59,781	23	1,374,963	13,060	14,366
Lewis	53,904	36	1,940,544	48,188	57,825
Lincoln	71,825	38	2,729,350	20,978	29,369
Linn	81,692	40	3,267,680	81,928	122,892
Livingston	95,540	41	3,917,140	50,650	65,845
McDonald	27,195	20	543,900	8,700	8,700
Macon	83,804	40	3,352,160	82,520	123,780
Madison	15,920	27	429,840	10,780	14,014
Maries	25,559	20	511,180	12,200	14,640
Marion	50,695	38	1,926,410	29,989	35,986
Mercer	66,091	40	2,643,640	58,630	70,356
Miller	32,263	26	838,838	16,630	19,956
Mississippi	39,051	26	1,015,326	4,470	4,470
Moniteau	41,105	30	1,233,150	25,500	30,600
Monroe	98,509	33	3,250,797	54,160	54,160
Montgomery	71,610	32	2,291,520	27,580	27,580
Morgan	36,706	30	1,101,180	23,520	28,224
New Madrid	39,278	28	1,099,784	2,610	3,132
Newton	42,834	20	856,680	11,000	11,000
Nodaway	236,173	40	9,446,920	56,500	90,400
Oregon	26,054	20	521,080	5,170	5,170
Osage	28,263	30	847,890	14,250	22,800
Ozark	30,875	14	432,250	3,670	3,670
Pemiscot	19,909	28	557,452	960	1,440
Perry	25,980	30	779,400	11,224	13,468
Pettis	98,035	28	2,744,980	45,163	63,228

CORN, HAY AND FORAGE—Continued.

County.	Corn.			Hay and forage.	
	Acres planted..	Average yield per acre, bu.	Total yield per county, bu..	Acres........	Total yield per county, tons.
Phelps	28,420	20	568,400	16,130	16,130
Pike	77,848	35	2,724,680	41,725	58,415
Platte	56,703	40	2,268,120	15,000	25,500
Polk	70,895	24	1,701,480	29,540	38,402
Pulaski	29,463	20	589,260	11,800	14,160
Putnam	66,268	35	2,319,380	67,760	81,312
Ralls	63,510	40	2,540,400	32,000	32,000
Randolph	55,970	33	1,847,010	21,650	25,980
Ray	117,351	35	4,107,285	43,760	70,016
Reynolds	13,959	20	279,180	8,730	8,730
Ripley	24,468	20	489,360	4,580	4,580
Saline	157,450	41	6,455,450	36,100	54,150
Schuyler	38,389	31	1,190,059	37,000	44,400
Scotland	59,816	31	1,854,296	51,430	61,716
Scott	33,687	26	875,862	7,240	7,240
Shannon	21,418	20	428,360	5,230	5,230
Shelby	76,756	40	3,070,240	53,865	70,024
Stoddard	51,553	28	1,443,484	8,050	10,465
Stone	31,072	20	621,440	7,525	7,525
St. Charles	41,879	38	1,591,402	16,800	25,200
St. Clair	71,512	26	1,859,312	30,540	30,540
St. Francois	18,715	25	467,875	15,140	15,140
Ste. Genevieve	15,236	26	396,136	9,230	9,230
St. Louis	40,310	36	1,451,160	32,060	54,502
Sullivan	74,384	39	2,900,976	94,200	113,040
Taney	27,825	18	500,850	3,545	3,545
Texas	48,939	17	831,963	25,200	25,200
Vernon	144,876	20	2,897,520	58,770	58,770
Warren	25,100	38	953,800	10,130	13,169
Washington	26,883	25	672,075	12,340	12,340
Wayne	26,225	27	708,075	10,860	13,032
Webster	39,283	19	746,377	21,630	21,630
Worth	52,076	40	2,083,040	26,040	36,456
Wright	33,568	19	637,792	19,400	19,400

SUMMARY OF THE ACREAGE, YIELD AND VALUE OF FARM CROPS FOR THE YEAR 1907 FOR THE STATE AND BY SECTIONS.

CORN.

Section.	Acres planted.	Average yield per acre, bu.	Total yield bushels.	Total value.
Northeast	1,380,436	36.6	50,509,548	$21,806,665
Northwest	2,183,074	39.5	86,314,480	36,549,099
Central	1,118,945	32.4	36,243,453	16,653,264
Southwest	1,547,670	23.8	36,887,072	17,313,345
Southeast	855,934	26.3	22,526,765	11,239,419
State	7,086,059	32.7	232,541,324	$103,561,792

WHEAT.

Section.	Acres sown.	Acres harvested.	Average yield per acre, bu.	Total yield bushels.	Total value.
Northeast	300,787	297,126	16.4	5,009,230	$4,222,508
Northwest	254,979	249,362	18.4	4,439,163	3,771,251
Central	465,721	450,174	13.1	6,455,885	5,506,945
Southwest	602,657	591,759	9.7	6,066,509	5,164,781
Southeast	657,813	635,657	10.4	6,859,227	5,998,916
State	2,281,957	2,224,078	15.6	28,830,014	$24,664,401

WHEAT SOWN, FALL 1907.

Section.	Acreage sown, 1907.	Acreage compared with previous year, %	Average condition crop, Dec. 1, 1907.	Previous five-year average con. Dec. 1, 1907.
Northeast	263,817	87	79	92
Northwest	243,264	95	88	93
Central	448,046	96	88	88
Southwest	566,993	94	86	87
Southeast	588,549	89	85	90
State	2,110,669	92	85	90

OATS.

Section.	Acres harvested.	Average yield per acre, bu.	Total yield, bushels.	Total value.
Northeast	218,712	24.7	5,281,385	$2,058,547
Northwest	145,634	26	3,418,877	1,365,184
Central	105,198	20	2,025,172	853,624
Southwest	187,320	17	3,114,101	1,269,411
Southeast	63,548	20.7	1,325,179	582,795
State	720,412	21.7	15,164,714	$6,129,561

HAY AND FORAGE.

Section.	Acres harvested.	Average yield per acre, ton.	Total yield, tons.	Total value.
Northeast	981,184	1.3	1,226,503	$9,665,036
Northwest	846,055	1.4	1,197,446	9,313,682
Central	546,443	1.3	684,616	5,949,386
Southwest	587,240	1.2	696,798	5,839,574
Southeast	327,189	1.2	394,664	4,550,724
State	3,288,111	1.3	4,200,027	$35,318,402

PRAIRIE HAY.

Section.	Acres sown.	Average yield per acre, tons.	Total yield, tons.	Total value.
Northeast	16,709	1.4	23,382	$137,270
Northwest	33,848	1.4	47,261	295,506
Central	15,496	1.4	21,692	130,553
Southwest	99,679	1	99,679	596,399
Southeast	2,213	1	2,213	19,260
State	167,945	1.2	194,227	$1,178,988

FLAX.

Section.	Acres sown.	Average yield per acre, bu.	Total yield, bu.	Total value.
Northeast	382	8	3,056	$3,056
Northwest	675	7	4,725	4,819
Central	1,370	8	10,960	11,179
Southwest	15,604	7	109,228	109,228
Southeast	....	....	....	....
State	18,031	7.5	127,969	$128,282

RYE.

Section.	Acres sown.	Average yield per acre, bu.	Total yield, bu.	Total value.
Northeast	3,800	15	57,000	$39,900
Northwest	6,750	18	121,500	85,050
Central	1,684	12	20,208	14,954
Southwest	1,955	12	23,460	17,829
Southeast	2,565	12	30,780	25,240
State	16,754	14	252,948	$182,973

BROOMCORN.

Section.	Acres sown.	Average yield per acre, lbs.	Total yield, lbs.	Total value.
Northeast	433	350	151,550	$6,737
Northwest	437	350	152,950	6,808
Central	473	350	165,550	7,360
Southwest	2,384	350	834,400	37,130
Southeast	150	350	52,500	2,332
State	3,877	350	1,356,950	$50,367

POTATOES.

Section.	Acres planted.	Average yield per acre, bu.	Total yield, bu.	Total value.
Northeast	13,622	96	1,307,712	$850,012
Northwest	19,708	91	1,793,428	1,291,268
Central	11,904	83	988,032	701,502
Southwest	15,524	70	1,086,680	880,210
Southeast	19,654	66	1,297,164	1,024,759
State	80,412	81	6,473,016	$4,747,751

SUMMARY OF TOTAL YIELD AND TOTAL VALUE OF FARM CROPS PRODUCED BY MISSOURI FARMERS IN THE YEAR 1907.

	Acreage.	Yield.	Total farm value.
Corn	7,086,059	232,541,324	$103,561,401
Wheat	2,224,078	28,830,014	24,664,401
Oats	720,412	15,164,714	6,129,561
Hay and forage	3,288,111	4,200,027	35,318,402
Prairie hay	167,945	194,227	1,178,988
Flax	18,031	127,969	128,282
Rye	16,754	252,948	182,973
Buckwheat	2,132	29,848	25,967
Barley	1,970	39,400	25,610
Broomcorn	3,877	1,356,950	50,367
Cotton	75,165	21,662,289	2,166,228
Potatoes	80,412	6,473,016	4,747,751
Tobacco	2,657	1,695,166	186,468
Sorghum seed	27,520	550,400	456,832
Sorghum syrup	27,520	2,339,200	935,680
Clover seed	27,800	50,040	400,320
Timothy seed	38,760	147,288	294,576
Kaffir corn, millet, cowpeas, castor beans, etc.	....	....	1,200,000
Miscellaneous vegetables	....	....	6,875,000
Total value of all crops	....	....	$188,528,807

CROP YIELDS 1907.

AVERAGE PER ACRE BY CROP SECTIONS.

	Crop.	N. E. Sec. 20 counties.	N. W. Sec. 21 counties.	Cent. Sec. 21 counties.	S. W. Sec. 23 counties.	S. E. Sec. 29 counties.	Whole State, 114 counties.
	Corn, bushels	36.6	39.5	32.4	23.8	26.3	32.7
	Wheat, bushels	16.4	18.4	13.1	9.7	10.4	15.6
	Oats, bushels	24.7	26	20	17	20.7	21.7
Hay	Timothy, tons	1.3	1.4	1.3	1.2	1.2	1.3
	Prairie	1.4	1.4	1.4	1	1	1.2
	Clover, tons	....	....	....	....	....	....
	Alfalfa, tons	2	3.3	2.3	2.4	2.6	2.6
	Cowpea, tons	2	2.2	1.5	1.6	1.6	1.8
	Flax, bushels	8	7	8	7	....	7.5
	Rye, bushels	15	18	12	12	12	14
	Buckwheat, bushels	17	18	15	9	10	14
	Barley, bushels	22	26	14	19	21	20
	Broomcorn, pounds	350	350	350	350	350	350
	Cotton (lint), pounds	....	....	....	208	295	288
	Potatoes, bushels	96	91	83	70	66	81
	Tobacco, pounds	822	490	553	575	750	638
	Sorghum syrup, gallons	80	107	83	69	89	85
	Sorghum seed, bushels	18	24	22	27	11	20
	Kaffir corn, bushels	38	28	25	22	15	25
	Cowpeas, bushels	30	17	14	10	9	16
	Clover seed, bushels	2	1.6	2	1.8	1.5	1.8
	Timothy seed, bushels	4.2	4.3	4	3	2.3	3.8

AVERAGE FARM PRICE, NOVEMBER 1, 1907.

The prices given in this table are governed by local conditions and are the current local prices prevailing in the country.

	N. E.	N. W.	Central.	S. W.	S. E.	State.
Corn, per bushel	$ .43	$ .42	$ .46	$ .47	$ .49	$ .45
Wheat, per bushel	.84	.84	.85	.85	.87	.85
Oats, per bushel	.38	.40	.42	.40	.43	.40
Flax, per bushel	1.00	1.02	1.02	.97	1.00	1.00
Timothy seed, per bu	2.00	1.90	2.60	2.20	2.40	2.20
Clover seed, per bu	8.00	8.00	8.00	8.00	7.70	8.00
Cowpea seed, per bu	2.00	1.50	1.60	1.00	1.70	1.60
Sorghum seed, per bu	.81	.73	.87	.72	1.05	.83
Kaffir corn, per bu	.90	.44	.68	.72	1.08	.76
Rye, per bu	.70	.66	.74	.76	.82	.73
Buckwheat	.78	.90	.71	.86	1.09	.87
Barley, per bu	....	.50	.65	.65	.80	.65
Potatoes, per bu	.65	.72	.71	.81	.79	.73
Sweet potatoes per bu	1.70	1.20	1.00	.95	.83	1.00
Winter apples, per bu	1.90	1.40	1.70	1.40	1.40	1.60
Timothy hay, tons	8.60	7.70	9.00	8.50	12.00	9.00
Clover hay, per ton	8.00	7.50	8.40	7.60	10.70	8.00
Alfalfa hay, per ton	11.00	9.60	10.00	9.00	12.90	10.00
Cowpea hay, per ton	8.00	8.00	7.00	8.00	11.00	8.00
Prairie hay, per ton	5.00	6.00	5.80	6.00	8.60	6.00
Broomcorn brush, per ton	....	68.00	81.00	81.00	41.00	73.00
Cotton lint, per lb	....	....	....	.10	.10	.10
Leaf tobacco, per lb	.11	.12	.11	.10	.10	.11
Wool, per lb	.25	.24	.23	.23	.23	.23

LIVE STOCK—AVERAGE FARM PRICE PER HEAD, DECEMBER 1, 1907.

	N. E. Sec.	N. W. Sec.	Cent. Sec.	S. W. Sec.	S. E. Sec.	State.
Horses.						
Spring colts	$55.	$56.	$51.	$49.	$47.	$52.
Yearlings	80.	81.	70.	73.	68.	.74
Two years and over	113.	120.	101.	97.	97.	105.
Mules.						
Spring colts	69.	74.	68.	62.	57.	66.
Yearlings	98.	104.	93.	87.	78.	92.
Two years and over	134.	148.	119.	119.	117.	127.
Cattle.						
Steer calves	15.	14.	14.	10.	9.	12.
Heifer calves	12.	11.	11.	8.	9.	10.
Yearling steers	24.	23.	22.	17.	14.	20.
Yearling heifers	19.	18.	17.	13.	11.	16.
Steers 2 years and over	36.	34.	31.	27.	20.	29.
Cows 2 years and over	33.	37.	33.	29.	26.	31.
Sheep.						
Lambs under 1 year	4.4	4.4	4.	4.4	3.6	4.
All other sheep	6.	6.	5.	5.	4.7	5.
Chickens.						
Av. price per lb	.07	.06	.06	.06	.07	.06
Turkeys.						
Av. price per lb	.12	.11	.10	.09	.10	.10

LIVE STOCK.—CONDITION AS TO THRIFT AND HEALTH, DEC. 1, 1907.

	N. E. Sec.	N. W. Sec.	Cent. Sec.	S. W. Sec.	S. E. Sec.	State.
Cattle	95	98	96	96	95	96
Horses	97	97	97	97	97	97
Mules	98	99	99	98	98	98
Hogs	94	90	95	92	86	91
Sheep	95	95	96	95	96	95

ANNUAL REPORT OF DR. D. F. LUCKEY, STATE VETERINARIAN, FOR THE YEAR DEC. 18, 1906, TO DEC. 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1906			
Jack Solman	Eureka, Mo	Letter, county clk.	Dec. 19	1 horse	Glanders	Destroyed.
D. M. Miller	Warrensburg, Mo	Petition	Dec. 18	75 sheep, 20 dead	Parasitic infestation	Treated.
D. M. Miller	Warrensburg, Mo	Petition	Dec. 17	Sheep	Parasitic infestation	Treated.
Wm. Winfrey	St. Louis, Mo	Return visit	Dec. 23	1 gray gelding	Chronic glanders	Quarantined.
Commercial Club	West Plains, Mo	Telegram	Apr. 14	Swine	Swine plague	Diseased animals burned.
Louis Herbert	Mexico, Mo	Letter county clk.	Apr. 26	1 horse	Ulcerated tooth	Advised operation.
J. B. C. Lecompte	St. Louis, Mo	Letter, Dr. Crowley	Apr. 26	1 horse, 1 mule	Glanders	Quarantined.
J. B. C. Lecompte	St. Louis, Mo	Return visit	Apr. 26	1 gray gelding	Glanders	....
Beal & McNamara	St. Louis, Mo	Letter, Dr. Farrell.	May 18	1 bey gelding	Glanders	Quarantined.
Continental Brick Co	Mehlville, Mo	Letter, Dr. Krumrey	May 18	Horses	Supposed glanders	Had been killed.
Geo. Brazier	Carrollton, Mo	Letter, Dr. Davis	May 22	1 mare	Glanders	Quarantined.
Chas. Gulath	St. Louis, Mo	Letter, Dr. Heyde.	June 10	1 bey gelding	Glanders	Quarantined.
L. Cohen	St. Louis, Mo	Letter, Dr. Phillips.	Sept. 12	1 gray gelding	Glanders	Quarantined.
J. W. Gooding, J. H. Owen.	Cairo, Mo	Petition	Oct. 3	45 cattle, 18 dead	Texas fever	Quarantined.
W. H. McCormack	Huntsville, Mo	B. A. I. Inspector	Oct. 3	3 sheep	Scabies	Quarantined.
Williams Cooperage Co	St. Louis, Mo	Dr. Hammerstein	Oct. 7	1 mule	Glanders	Dead on arrival.
Wurst Coal Co	St. Louis, Mo	Dr. Hammerstein	Oct. 7	1 black gelding	Glanders	Quarantined.
Ben Mayer	St. Louis, Mo	Dr. Hammerstein	Oct. 7	1 bay gelding	Glanders	Quarantined and reported to court.
Mueller Coal Co	St. Louis, Mo	Return visit	Oct. 7	Horses	Glanders	Stable quarantined.
Fred Duecker	St. Louis, Mo	Dr. Hammerstein	Oct. 21	1 bay gelding	Glanders	Quarantined.
Frank Ackermann	St. Louis, Mo	Dr. Hammerstein	Oct. 31	1 bay gelding	Glanders	Quarantined.

ANNUAL REPORT OF DR. R. C. MOORE, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
L. Solomon	612 Holmes, Kans. City.	Found on street	1906 Oct. 29	1 horse	Mange	
James Harrison	222 W. Leary, K. C.	Humane officer	Oct. 29	2 horses	Chronic glanders	Quarantined and reported to county court.
Milwaukee-Waukesha Brg. Company	1734 Grand ave., K. C.		Oct. 31	1 horse	Catarrh	Quarantined and given mallein test.
Henry Schultz	1300 E. 18th st. K. C.		Nov. 14	1 mule	Chronic glanders	Quarantined and reported to county court.
W. F. Hornbucker	5700 Prospect ave., K.C.		Nov. 20	1 horse	Chronic glanders	Quarantined and reported to county court.
J. D. Dury	308 Broadway, K. C.		Dec. 15	1 horse	Chronic glanders	Quarantined and reported to county court.
Jacob Weinberg	1333 E. 18th st., K. C.	By owner	Dec. 26	1 horse	Chronic Glanders	Quarantined and reported to county court.
N. B. Hayes	433 Brighton ave., K. C.	Dr. Byrd	1907 Jan. 6	1 cow	Suspected hydrophobia	Quarantined.
National Biscuit Co	3rd and Main sts., K. C.	K. C. Journal	Jan 7	Several horses	No disease found	
Water Works Dept	20th and Vine, sts., K. C.	Dr. Byrd	Jan. 15	Several horses	Suspected glanders	Held for development.
James Adams	Buckner, Mo	Dr. Byrd	Jan. 23	1 horse	Eszema	
C. E. Sanderson	1332 Broadway, K. C.	Owner	Jan. 29	1 horse	Chronic glanders	Quarantined and reported to county court.
Mrs. Quarrels	38th and Wabash sts. "	Owner	Feb. 17	1 horse	Suspected glanders	Quarantined and given mallein test.
Moore, Stewart & Brown	1336 E. 15th st., K. C.	Owner	Feb. 20	1 horse	Chronic glanders	Quarantined and reported to county court.
Water Works Dept	City Hall, K. C.		Feb. 20	2 horses	Chronic glanders	Quarantined and reported to county court.
Dillard & Ricketts	33rd and Forest, K. C.		Mar. 2	1 horse	Chronic glanders	Quarantined and reported to county court.
B. A. O'Connell	Independence, Mo		Mar. 8	1 horse	Chronic glanders	Quarantined and reported to county court.
Several parties	Martin City, Mo	Otto Sarget	Mar. 10	Several cattle	Food poisoning	
Several parties	Martin City, Mo	Otto Sarget	Mar. 11	Several cattle	Food poisoning	
Mrs. Alice Quarrels	38th and Wabash, K. C.	Return visit	Mar. 11	1 horse	Glanders	Reported to county court.
Pat Inman	2847 Holly st., K. C.		Mar. 18	1 horse	Glanders	Dead on arrival.

ANNUAL REPORT OF DR. R. C. MOORE, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907—Continued.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
T. S. Stone	2224 Michigan ave., K.C.	Owner	Mar. 22	1 horse	Chronic glanders	Quarantined and reported to county court.
J. Tobe	Chestnut and Guinotte, Kansas City	Fire Department	Mar. 24	1 horse	Necrotic tooth	
Adams	Raytown, Mo	Dr. Lint	Mar. 25	1 horse	Purpura hemorrhagica	
L. H. Fisher	1014 Campbell st., K. C.	Owner	Apr. 5	1 horse	Chronic glanders	Quarantined and reported to county court.
Mrs. Davis	21st and Central, K. C.	Dr. Werner	Apr. 11	1 horse	Elephantisis	Quarantined and reported to county court.
Thos. Cusack Co	103 S. W. Blvd., K. C.	Dr. Munday	Apr. 28	1 horse	Nothing found	
K. C. Laundry Co	9th and Woodland, K.C.	Humane officer	May 4	1 horse	Empyena of frontal sinuses	
Unknown	27th and Oak, K. C.	Jno. Andlauer	May 6	Horses	Supposed glanders	Horses not found.
Jno. Garrett	1523 McGee st., K. C.	Owner	May 9	1 horse	Chronic glanders	Quarantined and reported to county court.
Mr. Grossman	609 Grand ave., K. C.	Owner	May 17	1 horse	Mechanical pheumonia	
Henry B. Brooks	2112 W. Prospect, K. C.	Owner	May 25	1 horse	Chronic glanders	Quarantined and reported to county court.
Unknown	31st and Indiana, K. C.	Snoddy's Livery	May 27	1 horse	Suspected glanders	Horse not found.
Wm. Lincolnfelter	Foster, Mo	Dr. Luckey	June 14	Several horses	Coital exanthema	
Unknown	2627 Bales ave., K. C.	Humane officer	June 19	1 horse	Suspected glanders	Destroyed before arrival.
G. A. Vanhooser	1320 W. 25th st., K. C.	Mr. Allen	June 19	1 mule	Chronic glanders	Quarantined and reported to county court.
Geo. Warrington	4524 Euclid ave., K. C.		June 24	1 horse	Chronic glanders	Quarantined and reported to county court.
Mr. Kidd	518 Forest ave., K. C.		June 27	1 horse	Strangles	
P. S. Pollard	425 Westport ave., K.C.	Dr. Getchell	July 2	1 horse	Chronic glanders	Quarantined and reported to county court.
Henry Ebbs	3404 Jackson ave., K. C.	Humane officer	July 2	1 mule	Chronic glanders	Quarantined and reported to county court.
W. J. Tate	409 Oak st., K. C.	Owner	July 7	1 horse	Chronic glanders	Quarantined and reported to county court.

W. T. Aue	General delivery, K. C.	Mr. Aue	July 10	1 horse	Chronic glanders	Quarantined and reported to county court.
Geo. Owens	2525 Grove ave., K. C.		July 25	1 horse	Chronic glanders	Quarantined and reported to county court.
A. Shumway	1003 E. 12th, K. C.	Dr. Nicholas	July 25	2 horses	Chronic glanders	Quarantined and reported to county court.
A. Shumway	1003 E. 12th, K. C.		July 26	2 horses	Suspected glanders	Quarantined and held for further investigation.
J. M. Katzmeier	110 E. 19th st., K. C.	Owner	July 27	1 horse	New growth in nose	Mallein test.
Louis Schwitzgebel	439 W. 15th st., K. C.	Owner	July 31	1 horse	Chronic glanders	Quarantined and reported to county court.
Gray-Bryant Coal Co.	1029 St. Louis ave., K.C.	Jno. Andlauer	Aug. 1	1 horse	Suspected glanders	Quarantined and held for development.
A. Shumway	1003 E. 12th st., K. C.	Owner	Aug 3	1 horse	Chronic glanders	Quarantined and reported to county court.
Jno. Coleman	315 E. 19th st., K. C.	Dr. Werner	Aug. 5	1 horse	Chronic glanders	Quarantined and reported to county court.
Thomas Jones	10th and Broadway, K.C	Humane officer	Aug. 6	1 horse	Sore throat	
Fox & Son	1711 Main st., K. C.	Humane officer	Aug. 9	1 horse	Ulcerated tooth	
Adams Transfer Co.	228 West 4th st., K. C.	Owner	Aug 9	1 horse	General emaciation	
J. M. Snitz	818 Independence ave., Kansas City	Owner	Aug. 17	1 horse	Chronic glanders	Quarantined and reported to county court.

ANNUAL REPORT OF DR. R. C. MOORE, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.—Continued.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1907			
John Elsworth	2734 McGee st., K. C.	Owner	Aug. 18	1 horse	Chronic glanders	Quarantined and reported to county court.
J. M. Snitz	818 Independence ave., Kansas City	Owner	Aug. 20	1 horse	Chronic glanders	Quarantined and reported to county court.
Geo. Owens	2456 Vine, K. C.	Owner	Aug. 25	1 horse	Chronic glanders	Quarantined and reported to county court.
Louis Schwitzgebel	1609 Penn st., K. C.	Owner	Aug. 27	1 horse	Suspected glanders	Quarantined and held for development.
Weber Gas Engine Co.	Sheffield, Mo.	Owner	Aug. 28	1 mule	Chronic glanders	Quarantined and reported to county court.
H. C. Wherrett	1332 Monroe, K. C.		Aug. 31	1 horse	Chronic glanders	Quarantined for further developments.
Gray-Bryant Coal Co.	1209 St. Louis ave., K.C.		Sept. 1	1 horse	Suspected glanders	Quarantined for further developments.
H. C. Wherrett	1332 Monroe st., K. C.	Owner	Sept. 2	1 horse	Chronic glanders	Quarantined and reported to county court.
Geo. I. Weber	1818 Washington, K. C.	Dr. Brown	Sept. 3	1 mule	Chronic glanders	Quarantined and reported to county court.
Gray-Bryant Coal Co.	204 W. 9th st., K. C.	Owner	Sept. 7	1 horse	Chronic glanders	Quarantined and reported to county court.
Sam Braerlsohn	1517 Virginia ave., K. C.		Sept. 7	1 horse	Chronic glanders	Quarantined and reported to county court.
C. Reha	3113 Madison st., K. C.		Sept. 8	1 horse	Chronic glanders	Quarantined and reported to county court.
Amer. Sash and Door Co.	16th and Bellefountaine, Kansas City		Sept. 8	1 horse	Chronic glanders	Quarantined and reported to county court.
Unknown	2413 Montgall, K. C.		Sept. 9	1 horse	Bad teeth	
Louis Schwitzgebel	16th and Penn, K. C.		Sept. 14	1 horse	Chronic glanders	Quarantined and reported to county court.
James Goodman	1308 Lonsdale, K. C.		Sept. 15	1 horse	Chronic glanders	Quarantined and reported to county court.

Lewis & Kitchen	901 Broadway, K. C.	Dr. Getchell	Sept. 19	1 horse	Chronic glanders	Quarantined and reported to county court.
Unknown	Independence, Mo.	Dr. Gates	Sept. 17	1 horse	Pharyngeal paralysis	
Mr. Young	2420 Vine st., K. C.		Sept. 19	1 horse	Glanders	Destroyed before arrival.
Mrs. T. Martin	68th and Indiana, K. C.	Dr. Werner	Sept. 21	1 horse	Chronic glanders	Quarantined and reported to county court.
Leo Winningham	2322 Guinotte ave., K. C.		Sept. 22	1 horse	Chronic glanders	Quarantined and reported to county court.
B. Lusk	2014 Grand ave., K. C.		Sept. 22	1 mule	Chronic glanders	Quarantined and reported to county court.
E. C. Harrelson	118 Olive st., K. C.	Dr. Getchell	Sept. 24	1 horse	Chronic glanders	Quarantined and reported to county court.
P. Adams	1632 Cottage ave., K. C.		Sept. 30	1 horse	Chronic glanders	Quarantined and reported to county court.
Wolfe & Eddy Grain Co.	12th and Santa Fe, K. C.		Sept. 30	1 horse	Suspected glanders	Quarantined for mallein test.
Con. Murphy	555 Grand ave., K. C.		Oct. 2	1 horse	Mechanical pneumonia	Dead on arrival.
Wolfe & Eddy Grain Co.	12th and Santa Fe, K. C.	Owner	Oct. 8	1 horse	Chronic glanders	Quarantined and reported to county court.
Andrew Hale	2031 East 18th, K. C.	Owner	Oct. 14	1 horse	Chronic glanders	Quarantined and reported to county court.

ANNUAL REPORT OF DR. R. C. MOORE, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.—Continued.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1907			
W. M. Brassfield	2045 Penn st., K. City	Owner	Oct. 14	1 horse	Chronic glanders	Quarantined and reported to county court.
G. T. Kinney	1918 Baltimore, K. C.		Oct. 15	1 horse	Chronic glanders	Quarantined and reported to county court.
Dr. W. H. Gatchell	1617 Grand ave,. K. C.	Owner	Oct. 15	1 horse	Chronic glanders	Quarantined and reported to county court.
J. Ray Samuels	85th and Troost, K. C.	Owner	Oct. 17	1 horse	Glanders	Destroyed.
Jeff Perkey	1521 Michigan, K. C.	Owner	Oct. 21	1 horse	Chronic glanders	Quarantined and reported to county court.
S. Truax	2005 Olive st., K. C.	Owner	Oct. 24	1 horse	Chronic glanders	Quarantined and reported to county court.
Unknown	25th and S. W. blv., K.C.	Humane officer	Oct. 24	1 horse	Chronic glanders	Destroyed by Humane officer.
J. L. Sadler	Independence, Mo	Dr. Peck	Oct. 25	1 horse	Chronic glanders	Quarantined and reported to county court.
H. H. Reddick	2023 E. 18th st., K. C.	Dr. Gatchell	Oct. 25	1 horse	Chronic glanders	Quarantined and reported to county court.
T. S. Stone	2224 Michigan ave.,K.C.		Oct. 26	1 horse	Chronic glanders	Quarantined and reported to county court.
Dr. W. H. Gatchell	1617 Grand ave., K. C.	Owner	Oct. 29	1 horse	Chronic glanders	Quarantined and reported to county court.
Smith Yost Pie Co	210 Goodrich place,K.C.	Owner	Nov. 4	1 horse	Chronic glanders	Quarantined and reported to county court'
Jake Wolf	1732 Locust st., K. C.	Owner	Nov. 4	1 horse	Chronic glanders	Quarantined and reported to county court.
C. A. Page	Sibley, Mo	S. W. Hudson	Nov. 5	1 horse	Growth in frontal sinus	
S. Gardner	1310 Main st., K. C.	Dr. Parker	Nov. 6	1 horse	Chronic glanders	Reported to County court.
B. D. Savage	36th and Woodland,K.C.	Owner	Nov. 9	1 horse	Chronic glanders	Quarantined and reported to county court.
T. F. Ryan	2931 Forest ave., K. C.	Dr. Peck	Nov. 10	1 mule	Chronic glanders	Quarantined and reported to county court.
Mr. Brown	2518 Summit st., K. C.		Nov. 11	1 horse	Catarrh	
John Wiehe	2218 Pendleton ave.					

	Kansas City	Dr. Brown	Nov. 21	1 horse	Chronic glanders	Quarantined and reported to county court.
A. Shumway	1003 E. 12th st., K. C.	Dr. Brown	Nov. 21	2 horses	Chronic glanders	Quarantined and reported to county court.
J. S. Wolf	1919 E. 17th st., K. C.	Owner	Nov. 23	1 horse	Chronic glanders	Quarantined and reported to county court.
E. A. Baldwin	Independence, Mo	Owner	Nov. 24	1 horse	Ulcerated tooth	
C. Blick	2001 E. Front st., K. C.		Dec. 2	1 horse	Chronic glanders	Quarantined and reported to county court.
J. S. Wolf	1919 E. 17th st., K. C.	Return visit	Dec. 2			Released stable from quarantine.
A. Shumway	1003 E. 12th st., K. C.	Return visit	Dec. 3	2 horses	Suspected glanders	Released from quarantine.
G. A. Ennis	128 Olive st., K. C.	Owner	Dec. 4	1 horse	Chronic glanders	Quarantined and reported to county court.
S. K. Van Trump	2824 S. W. blvd., K. C.	Dr. Stewart	Dec. 6	1 horse	Chronic glanders	Quarantined and reported to county court.
Roy Feagan	1609 Euclid ave., K. C.		Dec. 9	1 horse	Acute glanders	Quarantined and reported to county court.
C. Blick	2001 E. Front st., K. C.	Return visit	Dec. 10			Released quarantine.
S. K. Van Trump	2824 S. W. blvd., K. C.	Return visit	Dec. 12			Released quarantine.
W. J. Long	2708 Flora ave., K. C.	Owner	Dec. 13	1 horse	Chronic glanders	Quarantined and reported to county court.
Geo. A. Ennis	128 Olive st., K. C.	Return visit	Dec. 13			Released stable from quarantine.
Dr. W. H. Gatchell	1617 Grand ave., K. C.		Dec. 14	1 horse	Chronic glanders	Quarantined and reported to county court.
B. Maloney	2425 Penn st., K. C.		Dec. 15	1 mule	Suspected glanders	Quarantined for further development.

ANNUAL REPORT OF DR. H. V. GOODE, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Diseases.	How disposed of.
			1907			
Geo. H. Baker	Weston, Mo	Dr. Luckey	June 14	144 cattle	Scabies	Quarantined.
John Waugh	Fairfax, Mo	Dr. Luckey	June 29	24 cattle	Scabies	Had been all shipped.
H. L. Prather	Tarkio, Mo	Dr. Luckey	Aug. 3	40 cattle	Scabies	Nothing found.

ANNUAL REPORT OF DR. S. SHELDON, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1906			
Chas. Simons	Trenton, Mo	Letter	Oct. 31	40 sheep	No disease	
James Crooks	Browning, Mo	Letter	Oct. 30	200 sheep	No disease	
Chas. T. Spencer	Chula, Mo	Telephone	Apr. 19	100 sheep	Scabies	Quarantined and treated.
A. W. Merryman	Trenton, Mo	Telephone	Apr. 19	240 sheep	Scabies	Quarantined and treated.
H. P. Merryman	Trenton, Mo	Telephone	Apr. 19	201 sheep	Scabies	Quarantined and treated.
S. G. Witten	Trenton, Mo	Telephone	Apr. 20	503 sheep	Scabies	Quarantined and treated.
O. A. Oyler	Spickard, Mo	Telephone	Apr. 20	166 sheep	Scabies	Quarantined and treated.
C. W. Key	Trenton, Mo	Telephone	Apr. 20	100 sheep	Scabies	Quarantined and treated.
Chas. Payne	Milan, Mo	Dr. Luckey	June 30	39 sheep	Scabies	Quarantined and treated.
L. C. Bowles	Lockspring, Mo	Telephone	Sept. 1	1 cow	Texas fever,	Quarantined.
A. A. Perry	Lockspring, Mo	Telephone	Sept. 3	2 cows	Texas fever	Quarantined.
Jno. Stanley	Lockspring, Mo	Telephone	Sept. 3	1 cow	Texas fever	Quarantined.
T. A. Abbott	Lockspring, Mo	Telephone	Sept. 3	1 cow	Texas fever	Quarantined.
L. G. Allsup	Lockspring, Mo	Telephone	Sept. 3	1 cow	Texas fever	Quarantined.
L. T. Stout	Lockspring, Mo	Telephone	Sept. 3	1 cow	Texas fever	Quarantined.
Jno. Roupe	Lockspring, Mo	Telephone	Sept. 3	1 cow	Texas fever	Quarantined.
Jas. Breeze	Lockspring, Mo	Telephone	Sept. 3	1 cow	Texas fever	Quarantined.
F. M. Achauser	Lockspring, Mo	Telephone	Sept. 3	1 cow	Texas fever	Quarantined.
W. P. Minnich	Lockspring, Mo	Telephone	Sept. 3	1 cow	Texas fever	Quarantined.
Wm. Bouersox	Lockspring, Mo	Telephone	Sept. 3	1 cow	Texas fever	Quarantined.
Frank Moore	Lockspring, Mo	Telephone	Sept. 3	1 cow	Texas fever	Quarantined.
Frank Richardson	Lockspring, Mo	Telephone	Sept. 4	2 cows	Texas fever	Quarantined.
N. W. Brookshire	Lockspring, Mo	Telephone	Sept. 4	1 cow	Texas fever	Quarantined.
Alex. Litton	Lockspring, Mo	Telephone	Sept. 4	1 cow	Texas fever	Quarantined.
Hugh Boules	Lockspring, Mo	Telephone	Sept. 4	1 cow	Texas fever	Quarantined.
Jno. Anderson	Lockspring, Mo	Telephone	Sept. 4	1 cow	Texas fever	Quarantined.
W. D. Rogan	Lockspring, Mo	Telephone	Sept. 4	1 cow	Texas fever	Quarantined.
Howard Bourn	Lockspring, Mo	Telephone	Sept. 4	1 cow	Texas fever	Quarantined.
L. Garr	Lockspring, Mo	Telephone	Sept. 4	2 cows	Texas fever	Quarantined.
H. W. Wise	Lockspring, Mo	Telephone	Sept. 4	1 cow	Texas fever	Quarantined.
A. L. Terry	Lockspring, Mo	Telephone	Sept. 4	1 cow	Texas fever	Quarantined.
John Bray	Lockspring, Mo	Telephone	Sept. 4	1 cow	Texas fever	Quarantined.
H. E. Moore	Lockspring, Mo	Telephone	Sept. 4	Cattle (38)	Texas fever	Quarantined.

S. G. Witten	Trenton, Mo	Dr. Luckey	Sept. 20	Sheep (567)	Supposed scabies	Quarantined and dipped.
Dr. R. J. Mitchell	Kirksville, Mo	Letter	Nov. 24	1 horse	Acute glanders	Quarantined and reported to county court.

ANNUAL REPORT OF DR. L. D. BROWN, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1907			
R. T. Morrison	Cowgill, Mo	Owner	Apr. 9	1 horse	Glanders	Quarantined.
A. J. Watkins	Lawson, Mo	Dr. Luckey	Apr. 22	Cattle	Tuberculosis	
R. T. Morrison	Cowgill, Mo	Return call	May 10	Horses	Glanders	Released from quarantine.
Roy Timbrook	Dawn, Mo	Dr. Luckey	Oct. 11	51 sheep	Supposed scabies	
J. W. Linton	Bedford, Mo	Sec'y. Ellis	Dec. 4	Horses	Intestinal worms	

ANNUAL REPORT OF DR. J. H. SLATER, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1906			
Warren Reyburn	Henry, Mo		Nov. 19	Horses	Suspected glanders	Found free from disease.
			1907			
David Long	Mendon, Mo	Sec'y Ellis	Feb. 17	1 bay mare	Bad teeth	
James Atterbury	Keytesville, Mo	Sec'y Ellis	Sept. 17	Cattle		Disposed of before arrival.
J. T. Lewis	Dalton, Mo	Dr. Luckey	Sept. 25	Sheep	Scabies	Quarantined.
T. R. Mayo	Clifton Hill, Mo	Dr. Luckey	Sept. 26	100 sheep	Scabies	Quarantined.
J. H. Rea	Carrollton, Mo	Dr. Luckey	Oct. 16	400 cattle	Scabies	No symptoms.
Lewis and Dorrance	Dalton, Mo	Return visit	Oct. 28	800 sheep	Scabies	Released from quarantine.

ANNUAL REPORT OF DR. R. B. LOVE, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1907			
Mo. Lumber & Mining Co	Grandin, Mo.		Jan. 14	13 horses & mules	Glanders	Had been destroyed.
A. M. Rowland	Stockton, Mo.	Sec'y Ellis	Jan. 19	1 mare	Chronic glanders	Quarantined.
Dr. Lee Heilman	Galena, Mo.	State Veterinarian	Oct. 10	2 horses	Chronic glanders	Quarantined.

ANNUAL REPORT OF DR. E. BRAINERD, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called	Date.	Kind of stock.	Disease.	How disposed of.
			1907			
W. L. Hale	Lancaster, Mo.	Dr. D. F. Luckey	May 23	34 sheep	Scabies	Quarantined.
M. A. Miller	Kirksville, Mo.	Geo. B. Ellis	June 13	1 horse	Glanders	Quarantined and ordered killed.
Stock Yards	Chicago, Ill.	Dr. Luckey	July 11	125 sheep	Scabies	Quarantined.
B. Simmons	Lancaster, Mo.	Wm. Payton thru Secretary	July 31	1 horse	Nasal gleet	Treatment.
W. H. Ewing	Rutledge, Mo.	Dr. Luckey	Oct. 3	180 sheep	Scabies	Quarantined.

ANNUAL REPORT OF DR. W. F. BERRY, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1907			
A. T. Bowers	Cassville, Mo.	Dr. Luckey	Feb. 11	1 horse	Bad teeth	
Several parties	Nevada, Mo.	Dr. Luckey	Mar. 17	18 horses, 2 mules	Scabies	Quarantined.
Arthur Burkholder	Smithfield, Mo.	Sec'y Ellis	Mar. 24	1 horse	Diseased submaxillary gland	
Heim Bros	Lamar, Mo.	Dr. Luckey	Sept. 7	84 cattle	Texas fever	Quarantined.
Richard Busy	Dedrick, Mo.	Dr. Luckey	Oct. 12	1 horse		Buried before arrival.

ANNUAL REPORT OF DR. STANLEY SMITH, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1907			
H. A. Leuking	St. Louis	Dr. Luckey	June 26	1 horse	Glanders	Killed.
J. D. Atterbury	Keytesville	Geo. B. Ellis	Oct. 12	Cattle	Poisoned by ivy	Removed from pasture.
Patton De Garmo	Warrenton, Mo	Petition	Nov. 26	Cattle	Corn stalk disease	Removed from stalk field.

ANNUAL REPORT OF DR. R. P. POAGE, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1907			
Stock pens	Clarence, Mo	Dr. Luckey	Apr. 19	Sheep	Scabies	Used corrosive sublimate wash.
Collison & Shale	Clarence, Mo	Dr. Luckey	Apr. 24	94 sheep	Scabies	Used lime and sulphur dip.
J. B. Shale	Clarence, Mo	Dr. Luckey	Sept. 7	50 sheep	Scabies	Used lime and sulphur dip.

ANNUAL REPORT OF DR. H. H. WOLF, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1906			
W. A. Thomas	Conception	D. F. Luckey	Dec. 11	Cattle	Scabies	Quarantined.
			1907			
N. O. Hopkins	Westboro	D. F. Luckey	Feb. 28	Cattle	Scabies	Quarantined.
J. S. Bradley	Elmo	D. F. Luckey	Mar. 3	Cattle	Scabies	Quarantined.
Harry West and H. D. Leonard	Burlington Junction	D. F. Luckey	May 17	2 horses	Glanders	Quarantined.
Jas. H. Criss	Quitman, Mo	Geo. B. Ellis	Oct. 7	2 horses	Supposed glanders	Found free from glanders.

ANNUAL REPORT OF DR. HORACE BRADLEY, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 17, 1906, TO DECEMBER 18, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1907			
Frank VanZant	Ladue, Mo	Sec'y Ellis	Jan. 7	10 calves	Intestinal disease	Treated.
Lynn Hockaway	Harrisonville, Mo	Sec'y Ellis	Apr. 17	1 horse	Chronic glanders	Quarantined and reported to county court.
C. S. Hockaway	Peculiar	Sec'y Ellis	Apr. 17	Horses & mules	Supposed glanders	Found free from glanders.
C. R. Hughes	Peculiar, Mo	Sec'y Ellis	Apr. 17	1 horse	Strangles	
A. M. DeJarnett	Archie	Sec'y Ellis	July 25	1 mare	Purpura hemorrhagica	
Mrs. C. Perry	Clinton	Sec'y Ellis	Aug. 14	2 horses	Chronic glanders	Quarantined and reported to county court.
Avery Badgett	Clinton, Mo	Sec'y Ellis	Aug. 16	1 horse	General debility	
O. P. Fitzeetr	Garden City	Sec'y Ellis	Oct. 12	5 horses	Not able to diagnose	
E. E. Wall and others	Leeton, Mo	State Veterinarian	Oct. 16	Cattle, 16 head	Forage poisoning	Changed pasture.

ANNUAL REPORT OF DR. J. H. McELROY, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1907			
W. B. Shipley	Grant City, Mo	Dr. Luckey	May 27	103 sheep	Verminous bronchitis.	Prescribed treatment.
D. L. Bressler	Grant City, Mo	Owner	May 28	Horses	Mange	Quarantined.
Wm. Stutesman	Stanberry, Mo	Citizens of Grant Cy	July 1	Horses	Mange	Quarantined.
Matthews Bros	Denver, Mo	Owners	Nov. 26	100 hogs	Hog cholera	Quarantined.

ANNUAL REPORT OF DR. CHAS. DOERRIE, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1907			
N. R. Brommer	Pilot Grove, Mo	Telephone	Aug. 5	1 cow	Texas fever	Dead.

ANNUAL REPORT OF DR. F. W. O'BRIEN, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1907			
Edw. Leonard	Apex, Mo	Sec'y Ellis	Mar. 26	Cattle (2)	Paraplegia	Dead upon arrival.
Stock pens	Edina, Mo	Dr. Luckey	June 27	Sheep	Scabies	Quarantined stock pens.
D. R. Sayre	Spalding Spring, Mo	Sec'y Ellis	Sept. 13	Mule	Bad teeth	
L. Cohen	St. Louis, Mo	Sec'y Ellis	Sept. 23	1 horse	Glanders	Quarantined and reported to court.
	Edina, Mo	Pros. Attorney	Nov. 12	Sheep	Scabies	

ANNUAL REPORT OF DR. T. E. WHITE, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1907			
Joseph Hoeflicker	Higginsville, Mo	Sec'y Ellis	Jan. 9	8 hogs, 3 horses		All dead.
J. D. Lowery	Fristo, Mo	Sec'y Ellis	Dec. 3	Calves	Spinal meningitis	

ANNUAL REPORT OF DR. JAS. CULLISON, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1906			
Mo. Lumber & Mining Co.	Grandin, Mo	Letter	Nov. 2	2 mules	Chronic glanders	Reported to county court.
Cattle men	Ripley county	Letter	Dec. 13	Cattle	Texas fever	Treated.
			1907			
T. D. McCown	Poplar Bluff, Mo	Letter	Sept. 9	1 horse	Bad teeth	

ANNUAL REPORT OF DR. H. F. BOETTNER, DEPUTY STATE VETERINARIAN, FOR YEAR DECEMBER 18, 1906, TO DECEMBER 17, 1907.

Owner.	Postoffice.	How called.	Date.	Kind of stock.	Disease.	How disposed of.
			1907			
Ennis King	Doniphan, Mo	State Veterinarian	May 31	1 horse	Bad teeth	

INDEX.

A — Pages

- Aberdeen Angus cattle, 279-284
- Agriculture, seal State Board of, 67
- Agricultural school, 426
- Agricultural College—
  - Farmers' week in, 69, 469
  - Report of committee, 10, 11
    - Hog cholera, 10
    - Students' judging contest, 10
    - Soil survey, 11
    - Poultry plant, 11
  - Recommendations for, 425
  - Recommendations for new building, 15, 16, 18
  - Prizes at Inter-State Fair, 19
  - Prizes at Missouri State Fair, 19
  - Prizes at American Royal, 19
  - Prizes at the International, 19
  - Road laboratory, 57
  - New building, 68
- Agricultural education, 17, 25
  - General discussion of, 301-319
- Alfalfa—
  - For hog feeding, 229
  - For hog pasture, 80-85
  - Seeding of, 83
  - For Southwest Missouri, 85-87
  - Mistakes in growing, 87-89
  - Cultivation of, 88, 89
  - General discussion of, 89-97
  - Number of hogs per acre of, 89-90
  - Kiln-drying, 92, 93
  - Chemical analysis, 94
  - In Pettis county, 95
  - In Bates county, 96
- Annual meeting Board of Agriculture, 9-40
- Apiary Inspector—
  - Appointment of, 23
  - Report of, 59-66
    - Apiaries inspected, 59
    - Foulbrood, discussion of, 60-65
- Auditing Committee, report of, 12-14

B

- Balanced rations, 201-203
- Beef production, 133-176
  - Registered sires, 137
  - Feeding the calf, 138
  - On high-priced land, 139

Beef production—Continued— Pages
  On cheaper land ... 142
  Baby beef ... 141
  Wintering calves ... 143
  Maintaining growth ... 146-148
  The first winter ... 149
  Winter pasture ... 149-151
  Winter shelter ... 151, 152
  The silo ... 152
  The second winter ... 153
  Coarse feeds for young cattle ... 155, 156
  Gains on grass ... 157
  Best season for fattening cattle ... 158-160
  Summer vs. winter feeding ... 160
  Different kinds of roughage ... 163-166
  Preparation of feed ... 166-173
  Effect of feeds on hog gains ... 172
  Feed and surroundings ... 173
  Pure water ... 174
  Regularity in feeding ... 175
  Time to market ... 175
Bees, diseases of ... 59-65
  Inspector of ... 59-66
  Law controlling ... 65-66
Board of Agriculture—
  Officers of ... 2
  Members of ... 3
  Executive committee of ... 2
    Powers conferred ... 17
  State Fair committee ... 3
  State Fair officers ... 3
  Veterinarians ... 4
  Annual meeting of ... 9-40
  Auditing committee, report of ... 12-14
  Officers elected ... 15
  Resolutions adopted ... 15, 16
  Seal adopted ... 67

C

Canning factory for the home ... 470-473
Cattle—
  Aberdeen Angus ... 279-284
  American Hereford Cattle Breeders' Association ... 284-288
  Farm price and condition ... 493
  Feeding (see beef production) ... 133-176
  Feeding for sale and show ring ... 295-300
  Number exported ... 242
  Scabies ... 43
  Shorthorn ... 288-294
  Texas fever ... 43-45
  Tuberculosis of ... 51-54
Chickens, average price ... 493
Cholera in hogs ... 97-119
Clover pasture for hogs ... 77, 78
Committee—
  On Agricultural College ... 10, 11
  Auditing ... 12-14
  Roads ... 17
  Road legislation ... 22

Pages
Concrete house, construction and plan 421-425
Contagious diseases—
  Eradication of 55
  Prevention of 402-404
Contributors—
  Baumgartner, Simon 85-87
  Bean, B. L. 419, 420
  Boles, J. W. 127-130
  Brasfield, H. R. 122-125
  Bright, W. A., Treasurer 38-40
  Brown, R. W. 131-133
  Carroll, M. V. 125-127
  Chapman, D. A. 405-409
  Clore, L. B. 359-364
  Connaway, Dr. J. W. 97-119
  Cowan, Hon. B. O. 288-294
  Darby, M. E., Apiary Inspector 59-66
  Davenport, E. 301-319
  Day, Dr. Edna 428-433, 465-469
  Densmore, Prof. Wayne 70-80
  Eckles, C. H. 190-206, 373-383
  Ellis, Geo. B., Secretary 1-37, 67-69, 480-507
  Elwood, Dr. C. A. 447-451
  Fraser, W. J. 390-399
  Gose, W. D. 80-85
  Harned, W. P. 231-233
  Henderson, Geo. 474-479
  Hill, Curits, Highway Engineer 56-58
  Hoffarth, Miss Annie 470-473
  Hughes, E. L. 341-343
  Hunt, Miss C. L. 433-442
  Kennedy, W. J. 295-300
  Kitchen, Geo. 279-284
  Lewis, P. P. 409-415
  Luckey, D. F., State Veterinarian 41-55, 402-404
  Miles, J. A. 399-401
  Miller, M. F. 343-359, 369-372
  Miller, Dr. W. McN. 442
  Miller, Mrs. Dr. W. McN. 443-446
  Mumford, F. B. 176-190, 235-240
  Raine, C. O. 321-324
  Rawl, E. H. 384-389
  Riehl, Wm. 421-425
  Roberts, J. E. 415-418
  Rommel, Geo. M. 240-265
  Russell, T. P. 91-97
  Sanborn, J. W. 266-279
  Sears, Mrs. F. H. 446, 447
  Stanley, Miss Louise 459-465
  Thomas, C. R. 284-288
  Tracy, Mrs. Emma P. 451-457
  Trowbridge, E. A. 206-215
  Waters, H. J. 133-176, 457-459
  Williams, C. G. 324-341
  Williams, Geo. W. 87-89
  Willson, C. A. 216-231
  Wilson, E. B. 120, 121
Cooking, method of teaching 459-465

- Corn— Pages
  - Acreage and yield 24
  - Barren stalks 362
  - Breeding problems 336
  - Breeding and selection 362
  - Contest for boys 20, 21
  - Cultivation 362
  - Detasseling 365
  - Ear test 364
  - Ear row test 331
  - Germination test 330
  - Grading seed 366
  - Growing and selecting seed 359-369
  - Inbreeding 366
  - In hog rations 71-79
  - Improving the crop 324
  - Judges—certified list 372
  - Length of ear 329
  - Maturity 327
  - Number of grains per hill 361
  - Prizes State Show 370-372
  - Plant selection 327
  - Selection of seed 326
  - Shape of kernel 329
  - Show, report of 369-372
  - Value of environment 325
  - Weight of ear 329
  - For hog feeding 229
- Corn Growers' Association—
  - Officers of 5
  - Annual meeting 321-372
  - President's annual address 321-324
  - Improving the corn crop by selection and breeding 324-341
  - The importance of corn breeding 341-343
  - Some experiments on Missouri soils 343-359
  - Growing and selecting seed corn 359-369
  - Report of State Corn Show 369-372
- Crop yields by sections 492
- Crops, general review of 24
- Crop review for 1907 480-492
  - Corn, yield and value by counties 486-488
    - Summary yield and value 489
    - Price 492
  - Wheat, acreage, yield and value 483-485
    - Summary 489
    - Farm price 492
    - Harvest calendar of the world 481
  - Oats, yield and value by counties 483-485
    - Summary of acreage and yield 489
    - Farm price 492
  - Hay and forage—
    - Acreage and yield by counties 486-488
    - Summary of acreage and yield 490
    - Farm price 492
  - Flax, summary of acreage 490
    - Farm price 492
  - Rye, summary of acreage 490
    - Farm price 492

Crop review for 1907—Continued— Pages

- Broom corn, summary of acreage 491
  - Farm price 492
- Potatoes, summary of acreage 491
  - Farm price 492

Crop rotation 270-271

D

Dairy Association meeting 373-427

- Transmission of dairy qualities by the sire 373-383
- Work of the U. S. Dairy Division in the south 384-390
- Better things for the dairyman 390-399
- A good price for good milk 399-401
- The cost of neglect 402-404
- Our duty 405-409
- The silo and the milking machine 409-414
- Improved dairy methods 415-419
- Breeding pure stock and how to make it pay 419-421
- A concrete house 421-425
- Resolutions 425-427

Dairying—

- Weeding out worthless cows 390-399
- A great record for one cow 391
- Where the profit comes from 393-395
- Cow-testing 396
- Dairy barn—plan for making 400
- Improved method of 415
- The silo 415-416

Dairy cows—

- Average production 238
- Individual feeding 416
- Improving the breed 419
- Feeding of 191-206
  - Spring pasture 191
  - Maintaining summer conditions 191
  - Grain feeding on pasture 192
  - Short pasture 193
  - Winter feeding 195
  - Over feeding 197
  - Amount of grain and roughness to feed 200
  - Silage 204
  - Timothy hay 204-205
  - Concentrated feeds 205
  - Some good rations 206

Divorce, discussion of 447-451

Dog-law 122-125

E

Economics in home 457-459

- Why it should be taught 465-469

Educational exhibit at State Fair 17

Experiments on Missouri soils 343-359

Encampment for boys 24-25

F

Farmers' week—

- Historical 69
- Missouri Sheep Breeders' Association 120-130
- Improved Live Stock Breeders' Convention 131-320
- Missouri Corn Growers' Association 321-372

Farmers' week—Continued— Pages
  State Dairy Convention . 373-427
  Missouri Housekeepers' Conference . 428-469
  Missouri Swine Growers' Convention 70-120
Farm management . 235-240
  The permanence of the family 268
  New England farming . 270
  Crop rotation . 270, 271
  Use of machinery . 272-273
  Tillage . 275
  Irrigation . 276
  Chemical fertilizers . 277
Farm labor . 239
Farm crops, summary acreage yield and value 491
Farm canning factory for the home 470-473
Farmers' institutes, secretary's report 23
Feeding cattle for show purposes 297
Feeds, for beef cattle 133-176
  For dairy cows . 190-206
  For hogs . 216-231
  For horses . 206-215
  For sheep . 176-190
Fertilizers . 277, 357
Financial statement—
  Of secretary . 26-37
  Of treasurer . 38-40
  Summary of . 35-37
Forage for cattle feeding 155, 156
Foulbrood, how to detect it 61
  Treatment of 62-64
  Law controlling . 65, 66

G

Glanders . 45, 46

H

Handicrafts, their revival in Missouri 446, 447
Hay, acreage and yield 24, 486
Hereford Cattle Breeders' Association 284-288
Highway Engineer—
  Committee on . 17
  Appointment of . 23
  Cross State roads . 56
  Road laboratory . 57
  Employment of convicts . 58
Hog-cholera . 10, 46-50
  Immunization against . 97-119
Hogs, number exported . 242, 256
  A worm remedy for 230
  A lice remedy for 230
Hog feeding . 216-231
  Experiments in . 70-80
  Pasturage . 70-79
  Meat meal and tankage 72
  Feeding brood sows . 83, 220, 221
  Care of the male 220
  Number per acre on alfalfa 89, 90
  Gains from cattle feeding 172
  Supplemental grains . 173

Hog feeding—Continued— Pages

- The foundation stock 217
- Grades vs. scrubs 218
- Feeding young pigs 224
- Feed after weaning 225
- Cost of feed 227-229
- Condition powder 230

Horses—

- Feeding of 206-215
- Care and feed for stallons 209
- Care and feed for mares and foals.......... 210-213
- Feeding for growing horses.......... 214
- Feed for work horses 215
- Number exported 258-261
- Glanders in 45, 46
- Chas. Reade, pedigree 474-479
- Farm price and condition.......... 493

Horticulture at Inter-State Fair.......... 21

Household science 59

Housekeepers' Conference 428-469

- Constitution of 428, 429
- Our conference 429-433
- Household adjustment to technical development.......... 433-442
- Some aspects of home sanitation 442, 443
- The pure milk problem.......... 443-446
- The revival of Missouri handicrafts 446, 447
- The present crisis of the American home.......... 447-451
- The home 451-457
- The home economics movement.......... 457-459
- The inductive or scientific method of teaching cooking.......... 459-465

Home economics 465-469

I

Illustrations—

- Group officers and members State Board of Agriculture—frontispiece.
- Calves underfed 144
- Calves overfed 144
- Calf, early maturing type.......... 147
- Calf, slowly maturing type 147
- Chas. Reade (horse) 475
- Cattle in the shade 159
- Concrete house 421-424
  - Floor plans 422-424
- Corn charts 337-339
- Chester Matheny, prize winner.......... 367
- Dairy record charts 374-378
- Diagram—feeding dairy cows 196-198
- Early maturing cattle 140
- First prize white corn.......... 321
- First prize yellow corn.......... 322
- Foulbrood 60, 61
- Grand champion Angus steer.......... 482
- Good Angus head 320
- Good ear of corn.......... 323
- Good and poor cow.......... 397
- Group of cattle, good quality.......... 176
- Group of sheep 178-182
- Hog Cholera inoculation 99
- Hog Cholera ulcers 111
- Hog Cholera, drawing blood 113-115

Illustrations—Continued— Pages
- Harvesting corn on College farm.... 154
- Hogs after cattle 172
- Holstein cow, Missouri Chief Josephine.... 194
- Hog-house, Missouri Experiment Station.... 218
- Hog-cote, Missouri Experiment Station 222
- Home canner 470, 471
- John Eames, prize winner 366
- Jersey cow, University Dazie.... 192
- Jersey cow, Bessie Bates.... 199
- Lamar experimental field 353
- Monroe City experimental field 346-349
- Milking machine 427
- New Agricultural building 68
- Percheron stallion 212
- Plan of model kitchen.... 431
- Percheron mares and foals.... 207
- Paul Laughlin, prize winner.... 365
- Pigs exposed to cholera.... 103, 105, 107, 109
- Students judging swine 479
- Seal Board of Agriculture.... 67
- Shorthorn cow 135
- Silo on State farm.... 153
- The profitless cow 397
- Yearling cattle, Experiment Station.... 134

Improved Live Stock Breeders' Association.... 131-320

Inter-State Fair 19-22
- County exhibits 20
- Boys' corn contest 20, 21
- Horticulture 21

Irrigation 276

K

Kitchen, a plan for 430, 431
- Equipment 432, 433

L

Live Stock Breeders' Association.... 131-320
- President's annual address 131-133
- Beef production 133-176
- Rational sheep feeding 176-190
- Feeding the dairy cow.... 190-206
- Feeding and care of horses.... 206-216
- Swine feeding 216-231
- Pedigree 231-235
- Farm management 235-240
- Development of the export trade in pure bred live stock.... 240-266
- Farm management 266-279
- Aberdeen Angus breed 279-284
- Hereford cattle 284-288
- Shorthorns 288-295
- Fitting animals for sale and the show ring.... 295-300
- The next step in Agricultural education.... 301-319
- Resolutions 319-320

Live stock—
- Improvement of 238
- Export trade 240-265
  - Exports of purebreed cattle, horses, hogs, etc.... 242
  - Disease in foreign countries.... 244

Live stock—Continued— Pages
        Frauds in pedigree ... 245
        To build up export trade ... 246
    American types in blood lines ... 248
    Condition ... 493
    Farm price ... 493

M

Manure, value of ... 236
Meatmeal for hogs ... 72
Meat inspection ... 41, 42
Milk—the pure milk problem ... 443-446
Milking machine ... 413, 415, 418
Milk records ... 374-377
Milk, a good price for ... 399
Missouri crop review for 1907 ... 480-493
Missouri Dairy Association ... 373-427
    Officers of ... 6
Missouri Corn Growers' Association ... 321-372
Mules—farm price and condition ... 493

O

Oats, value of crop ... 24
    Acreage and yield ... 483

P

Pasture for hogs ... 71-79
Pedigree—
    General discussion of ... 231-234
    Of Chas. Reade ... 474
    Of dairy sires ... 373-383
Poultry plant ... 11
Prizes won by Agricultural College ... 19

R

Rape for fattening sheep ... 188
Reade, Chas., pedigree ... 474
Report of—
    Secretary (annual) ... 18-37
        Inter-State Fair ... 19
        The New Road law ... 22
        Apiary inspection ... 23
        Farmers' institutes ... 23
        Farm boys' encampment ... 24
        Financial statement ... 26
    Apiary Inspector ... 59-66
    State Highway Engineer ... 56-58
    State Veterinarian ... 41-55
        Scabies ... 43
        Texas fever ... 43
        Glanders ... 45
        Hog cholera ... 46
        Tuberculosis ... 51
        Legislation ... 54
    Treasurer ... 38-40
    Veterinarians ... 494-507
Resolutions—
    Live Stock Breeders' Association ... 319, 320
    Board of Agriculture ... 15, 16
    State Dairy Association ... 425

Pages
Road law ... 22
Roads, State aid for ... 22
Roads, legislation recommended ... 22, 23
Road laboratory ... 57
Roads, employment of convicts on ... 58

S

Sanitation of the home ... 442
Scabies of sheep and cattle ... 43
Seal, State Board of Agriculture ... 67
Secretary Board of Agriculture (report) ... 18-37
Seed corn for soiling ... 194
Sheep Breeders' Association, annual meeting ... 120-130
  Care and management of the flock ... 120, 121
  A sheepman's experience in the Missouri Legislature ... 122-125
  Value of organization ... 125-127
  Shall we use western ewes ... 127-130
Sheep, scabies ... 43
  Number exported ... 262-265
  Management of the flock ... 120-125
  Care of the lambs ... 121
  Care of the ewes ... 121
  Legislation ... 122-125
  Western ewes ... 127-130
  Average production of wool ... 233
  Feeding ... 176-190
  Breeding ewes ... 177
  Summer feeding ... 177
  Fattening lambs ... 180
  Experiments compared ... 181
  Shelter for fattening sheep ... 181
  Shearng lambs ... 183
  Self-feeder ... 184-187
  Rape for winter fattening ... 188
  Roots in ration ... 189
  Conclusions ... 190
Shorthorns ... 288-294
Silo—
  For the beef farm ... 152
  For the dairy cow ... 204
  Experience with ... 409-416
Slaughter-houses ... 41, 42
Soil—
  Survey ... 11-16
  Fertility ... 236
  Experiments in Missouri ... 343-359
    Composition of soil ... 344
    In Northeast Missouri ... 345
    Humus supply and mineral elements ... 351, 352
    In Southwest Missouri ... 353
    The use of fertilizers ... 357
    Ground limestone ... 358
State Veterinarian (annual report) ... 41-55
State Highway Engineer (annual report) ... 56-58
State Apiary Inspector (annual report) ... 59-66
Swine feeding (see hog feeding) ... 216-231
Swine Growers' Association ... 70-120
  Iowa experiments with hogs ... 70-80

Swine Growers' Association—Continued— Pages
  Alfalfa and hogs 80-85
  Alfalfa in Southwest Missouri 85-87
  Alfalfa 87-97
  Immunization against hog cholera 97-119

T

Texas fever 43-45
Tillage, value of 275
Timothy—
  Acreage and yield 486
  Pasturage for hogs 77, 78
  For dairy cows 204, 205
Tomatoes, value of an acre 73
Tuberculin test, appropriations recommended 55
Tuberculosis 444
  Of hogs 80
  Of cattle 51-54
  Recommendations 16
  To get rid of it among dairy herds 402-404
Turkeys, average price 493

V

Veterinarian—
  Report of State 41-55
  Report tabulated 494-507

W

Wheat, acreage and yield 24, 483

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